SUPPLEMENT NO. 3

The Journal of the
American Leather Chemists Association

LEATHER MAKING

A Discussion of Practical Problems of Tanning and Leather Manufacture

Sponsored by the Combined Production Clubs

DELAWARE VALLEY TANNERS' CLUB
NEW ENGLAND TANNER'S CLUB
TANNERS' PRODUCTION CLUB OF WISCONSIN

Wednesday June 9th, 1954
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SYMPOSIUM COMMITTEE:

WENDELL MORRIS, Chairman

Eagle-Ottawa Leather Co., Grand Haven, Mich.

C. DAVID WILSON, Secretary

Fred Rueping Leather Co., Fond du Lac, Wis.

SUB-COMMITTEES:

Calfskin Division

CHARLES A. MARTIN
E. Hubschman & Sons, Inc., Philadelphia, Pa.

Side Leather

W. ROBERT LOTZ
A. Trostel & Sons, Milwaukee, Wis.

Upholstery Leather

JAMES K. KOENIGER
Blanchard Bros. & Lane, Newark, N. J.

Goat and Kid Division

REUBEN G. HENRICH
Surpass Leather Co., Philadelphia, Pa.

Sheepskin Leather

CHARLES T. CARES
John Flynn & Sons, Inc., Salem, Mass.

Sole Leather

ARTHUR N. KAY
Howes Leather Co., Inc., West Hickory, Pa.

FOREWORD

Following upon a successful Round Table Discussion, sponsored by the New England Tanners' Club at Swampscott, Mass., June 4, 1952, many persons in the industry expressed the wish that the American Leather Chemists Association should hold another symposium on leather making.

The Council of the A.L.C.A. decided to expand the scope of these practical meetings and invited participation by all of the national leather Production Clubs, and provided a whole day during the Annual Meeting at Bedford Springs, June 9, 1954.

This meeting was again declared by many to be successful and the hope was expressed that the A.L.C.A. would continue from time to time to hold such meetings. In fact, some have suggested that the meetings be more frequent because of the inability to cover the broad subject of leather manufacture in a reasonable time. For example, in two years the only topics covered have been soaking, liming and bating. Many more phases of leather making are yet unexamined.

The A.L.C.A. believes that these discussions should be published and made a permanent record, for two reasons: First and foremost, the obligation the Association has to its membership at large, particularly to those who were not able to be present at the meeting. Secondly, the written record will be a valuable source of information.

I further feel that, with the record in your hands, in time to come the production men will profit by the experience and improve the discussion and will be guided in their future conferences.

This discussion of the joint Production groups was held under the chairmanship of Mr. Wendell Morris, and a committee organized to embrace the various major categories of leather production. The complete list of committees is given on the following page.

If these practical discussions give new ideas to the leather chemist, and particularly the leather research scientist, then the A.L.C.A. and the industry will profit from the continued reporting of leather research in the Journal.

H. G. Turley, Ph.D.
Past-President

August 25, 1954

The American Leather Chemists Association

Wednesday Morning Session

June 9, 1954

The Wednesday morning session convened at 9:30 a.m., in the Convention Hall. President Turley opened the session and introduced the program of the day, under the Chairmanship of Mr. Wendell Morris—this day being devoted to "Leather Making—a discussion of practical problems of tanning and leather manufacture," conducted by a combined committee of Production Clubs of the Delaware Valley Tanners, Wisconsin Tanners and New England Tanners.

COMMITTEE: General Chairman—Wendell Morris. Secretary—C. David Wilson.

SUB-COMMITTEE: Calfskin Division—Charles A. Martin; Side Leather—W. Robert Lotz; Upholstery Leather—James K. Koeniger; Goat and Kid Division—Reuben G. Henrich; Sheepskin Leather—Charles T. Cares; Sole Leather—Arthur Kay.

H. G. TURLEY (Rohm and Haas Co): When we look back upon the past history of the Association, for quite a number of years we talked about the practical men and the chemists not understanding each other, which I felt in my own mind was rather exaggerated. But I hope by these meetings, which have been instituted in the last two or three years, we will forget all of that.

Chemistry and the practical problems are all a part of the same subject. We do not expect the tanner to learn chemistry—it is not necessary; but we expect the chemist at least to learn the language of the tannery.

So without further ado, we will turn this meeting over to the Combined committee of the Production Clubs, under the Chairmanship of Mr. Wendell Morris. I hope you all have a pleasant day and go on as long as you wish to, and really "shoot the works."

CHAIRMAN W. MORRIS (Eagle-Ottawa Leather Company): Fellow leathermakers: The precedent for this meeting was initiated by the New England Tanners Club in 1952 and the success of that meeting, and the interest, were such that it seemed to be worth while to continue on a larger scale. Therefore, this Committee, representing the combined efforts of the three Production Clubs, is presenting a symposium to continue with a discussion of the problems incidental to the conversion of the various types of raw material in our industry.

Organizational work was done by a Committee of nine men representing the three areas of the industry. As panelists and discussion leaders for each group, I am pleased to introduce the following:

(Chairman Morris introduced the members of the panel.)

MALCOLM H. BATTLES (A. C. Lawrence Leather Company), who will have charge of the roving microphone, is also a part of the group.

In addition to these men we appreciate the contribution of Daniel Lord of P. S. Barnet and Sons and Frank Dreuding of Dreuding Bros. Company also on the Committee, representing the three Clubs.

We call attention to the large share of organizational work and planning on the part of our Committee Secretary, C. D. Wilson.

C. D. WILSON (Fred Reuping Leather Company): Thank you, Wendy. It is my purpose now to start this meeting going. We would like to ask your cooperation on several points.

First I want to let you know that this is not a panel of speakers. We are not up here to lecture or give speeches. We are not experts in our fields. We don't intend to be and we don't pretend to be experts. We don't want to have you question us as if we were experts. Our sole purpose up here is simply to try to control what discussion takes place among you people. This program is designed mainly for you. We want most of this program to be from you. This is audience participation, strictly.

If there are any opinions or facts which members of this panel can present, they will do so. But mainly, we want this program to be from the practical leather makers of the industry, and they are you.

The second point I would like to bring up is this: after some discussion it was finally decided that we would avoid—and let us more or less make this kind of a rule of the game today—any specific references to raw stock. I mean to say, let us consider any discussion we have today as relative to, let us say, two-months production in your tannery—good hides, bad hides, all kinds of hides.

And furthermore, I think we can get more done if we do not refer to specific sources of hides such as South American hides, or New Zealand. Let us consider hides in general in each one of these six categories—that will save us time.

A third point I would like to emphasize: none of these panel members is going to make any speeches. Anything they have to say they have been asked to say in a short period of time. There will be no lectures and no speeches, and we will appreciate your cooperation in this matter. We want your opinions and we want your experiences and so does the rest of the audience. But I think in a whole day we can get more done if we have no speeches from either the panelists' table or the floor.

A fourth point: the New England Club in 1952 did such an outstanding job of covering the subject of soaking, that the organizational committee has decided to start this panel discussion on the subject of liming and unhairing. If there is any reference to soaking, there is nothing wrong with making references to it. But our first basic topic this morning is liming and removing the hair, from these six standpoints.

In order to get the program going, I am going to call on a panelist. He will give you, we hope, some provocative thoughts on the subject of liming of goat and kid. Dr. Reuben Henrich, can you start this discussion by giving us, some problems or some of your experiences in the liming of goat skins?

REUBEN G. HENRICH (Surpass Leather Company): First of all, I just want to make this point: some of you are probably wondering why there is a chemist on the panel. I have been lucky enough in the last twenty-five years to be in production, in which my chemical background has helped me considerably. If I have to, I can still go into the laboratory and do an analysis, although I have not done much of that for a good many years. I have been out in the plant, just like some of the rest of you have, in old clothes and a pair of rubbers, or boots, if necessary, working along in the practical application of making leather.

What is the purpose of liming besides the fact that you want to remove the hair? What do you have in mind in your finished leather that goes all the way back to liming?

We are looking for a very smooth, silky grain. We are trying to keep that grain down. We feel that liming plays a part in this. Personally, from the mechanics of it, we like to lime in drums—in fact, very large drums, in which all of our materials are put in ahead of time, well mixed and then the skins added.

These drums run very slowly about four or five R.P.M. and are only run for five or ten minutes in the morning and maybe another five minutes later on in the day.

I know that liming can be done by other means. But we have found that we get very satisfactory results liming this way.

In regards to length of time, that is going to vary with different people. At one time we limed for something like two weeks. Now, with the aid of accelerators, we have cut that down to less than a weeks time.

We find that the hair we get as a by-product is better than it was with the longer liming. We get—at least we feel that we get—just as good a grain, possibly a little better grain than we did with the longer liming

I am not so sure that some of the other people in the industry do. They may use different sharpening agents than we. There are plenty that can be used. We also find that in this drum liming, it is fairly easy to control our temperature. The drums are closed up and we find practically no variation in temperature from the time the stock is put in, until we take it out.

We have found that at times it was advantageous to put in all of our lime, and if we are going to make the lime a little more alkaline, to run the stock in the lime and sharpening agent for maybe a couple of hours. That is, we did not keep running the drums all that while but they were run for about fifteen minutes and the stock lay in the liquors for about two hours, and then the alkali that we were going to add was put in, rather than putting it in at the beginning. It did help as far as grain was concerned. We got a much smoother grain.

I know there are some other people in the audience who have had experience with goat skins. I wonder if they would be willing to make a few remarks and tell us a little bit about their experiences.

C. D. WILSON: Mr. Henrich made the one point very clear, it seems to me namely, that he felt that time of liming is an influence on that important quality they look for—flatness of grain. What about that, is that right? Is there someone in the audience who has had this experience and has either an agreeing opinion or a disagreeing one?

F. PANEPINTO (William Amer Company): Just like Reuben, my chemical background has helped me also.

He mentioned drum liming. I have had experience with liming in the reels and there is one unexplained phenomenon that occurs at irregular periods. When the limes are prepared and skins are put in, sometimes the lime immediately separates as though there were two similar charges present, and the lime seems to precipitate completely. In those cases we found we did not get too much penetration of the lime.

With succeeding limes nothing happened for another week or two and then suddenly it happened again. In other words, the condition occurred at such irregular periods that it was difficult to tie down or try to study except on that particular reel where it had already happened. If someone else has had that experience, either with goat skins or liming in general, I think it might help if we exchange experiences.

CHAIRMAN MORRIS: Has anyone else present noticed this phenomenon, or do you have any explanation for it? I think that is a rather unusual observation and is perhaps pertinent to the type of beamhouse carried on by the goat skin people.

C. A. ROSS (Ohio Leather): Hydrated lime tends to separate, whereas a quicklime that is slack seems to stay in solution. Why it happens, I don't know, but I have definitely seen that effect.

H. BERNARD (G. Levor and Company): I would like to suggest that the water conditions could have a large bearing on the lime separating in that man-

ner. If separation takes place first, before the skins are put in, or possibly if separation occurs after the skins are put in should be important. Possibly the skins are not thoroughly washed, thereby carrying some salt or other chemical matter into the lime and thereby separating.

A. SALAMATOV (Barrett and Company, Inc.): I am not clear what is meant by separation of lime. Is that precipitation of the soluble portion of the lime, or is it a separation of the excess of lime that is uaually put in? When it is said that lime is separated, what does it mean? If it is filtered it will not be any more alkaline, or what is it?

R. G HENRICH: Can you answer that?

F. W. PANEPINTO: It is separated and is no longer in the milky condition. You get a relatively clear solution and all of the lime seems to precipitate.

HENRICH: Your particle size seems to increase?

WILSON: But the alkalinity remains high?

PANEPINTO: Yes. Mr. Ross suggested that he has not noticed that condition in slack lime. I have noticed it in both. That is what makes it more mysterious. And to answer the suggestion just made about salts in water, we have analyzed the water and in some cases it has happened from one week to the next, that is, in a seven-day liming. There was nothing unusual about the water. Everything appeared to be the same. The only theory I had which might have some value is that something may have been left in the tub that may have caused this charge that would be similar to the charge of the succeeding lime.

I. L. RIESE (R. Neumann and Company): I once ran a simple test in which I took two large glass cylinders and poured distilled water into one and tap water into another. I weighed out the same amount of lime in each and shook each one for the same length of time. In the case of the distilled water there still remained a suspension of very fine particles even after the main body of lime had settled to the bottom, but in the case of the tap water the lime settled completely and in a much quicker time. This definitely indicates a difference in the colloidal conditions existing, and should be a very interesting problem to investigate.

WILSON: Perhaps it might be a good idea to call on the aid of a physical chemist. Is there anyone here who might comment on water quality from a physical chemist's standpoint and its influence on the suspension of solid lime in hard water, soft water, organic matter and so forth?

CHAIRMAN MORRIS: Mr. Riese has proposed that a possible explanation for this separation of the lime, or the precipitation, as you will, may have some relation to the quality of the water and he suggests that he has observed a difference in this phenomenon by using distilled water and the regular production water.

G. H. W. HUMPHREYS: I am not a physical chemist but I would like to make a contribution, if I can, to this question. I was particularly interested that the gentleman who asked this question is using quicklime, because I think that the question of the hydrating is really the whole crux of the matter.

Some years ago—and I make no claim for originality on this, a member of the Imperial Chemical Industries' staff, (not a member of the leather industry) made a study of lime—he had this question of slaking of lime in connection with the British Leather Manufacturers Research Association, and he found that the method in which lime was slaked had very considerable effect on the particle size and therefore on the rate of settling of the lime suspension.

It is rather strange and by coincidence that I think there is somebody in this room, whose tannery I was in, two or three weeks ago, who actually raised this problem and who was good enough to supply me with a sample of hydrated lime and also a sample of quicklime.

We took these limes back to the laboratory and did a few experiments with them, and summing up what happened, it was this: we had four measuring cylinders in which we put lime suspensions prepared in this way: the first two had the quicklime which had been hydrated and in the first cylinder it was quicklime hydrated with cold water, with a minimum of cold water, just sprinkling cold water on to a heap of lime. The second suspension was prepared by an excess of hot water, more hot water to cover the amount of lime in the bottom of the beaker, and the third and fourth cylinders contained the hydrated lime also made in suspension first, with the cold water and secondly, with the hot water.

These suspensions were prepared at five per cent suspension of lime in the water, made up to volume and shaken and allowed to stand. And the results were very striking, I do not have the figures with me here, but what it amounted to was this: that after, say, a quarter of an hour of the settling there was of the order of about 80 cc's of lime still remaining in suspension for the quicklime slaked with cold water, whereas the one slaked with hot water had still got 99 cc's of lime suspension.

The two hydrated limes were 82 or 83. So the sum total of what I am trying to say is that I think the slaking of the lime is the important thing. If you slake with an excess of hot water you get a much finer particle which sinks much more slowly. I think probably that is where your physical chemist comes in. I am not a physical chemist but that is my observation and I have known it to work very well in a tannery.

CHAIRMAN MORRIS: Thank you, Mr. Humphreys. Can anyone else supply further light on this phenomenon?

HENRICH: I would like to say this: we use a hydrated lime, but definitely the rate at which the lime settles makes considerable difference in the action you get on skins as far as unhairing is concerned and also as far as the leather is concerned.

When we think of a new source of lime, if we have to, we not only examine it from the chemical standpoint, but also from the rate of settling. A lot of times two limes which are fairly close chemically, but which have an entirely different rate of settling, give you a big difference in the type of leather you get. At least that has been our experience.

WILSON: Is this still flatness of grain you are talking about?

HENRICH: Yes. Flatness of grain, grain character. Primarily we are interested in flatness of grain in glazed kid. A goat skin has a fairly high grain to start with and we are interested in keeping it down all along the line. Our entire operation is practically based on that.

I would like to ask Frank another question:

If you had the opportunity to start from scratch in a tannery and build a tannery, would you put in drums for your liming, or put in paddles?

PANEPINTO: Drums, definitely.

MEMBER: I was wondering about some clarification of that—is that just a curdling or a settling?

PANEPINTO: Definite settling.

MEMBER: I have noticed a curdling in some cases.

PANEPINTO: You are speakiing of particle size. I was connected with a lime company at one time and it produced a type called pressure hydrated, a lime of very small particle size. Even that type of lime gave the same condition that Mr. Humphreys mentioned. Mr. Humphreys mentioned that he noticed that condition with slaked lime but not the hydrated lime. I have noticed it with all types of lime—both slaked and hydrated.

CHAIRMAN MORRIS: Would the effect of this condition be such that it would not be of considerable importance, let us say, in a drum liming or do you believe that condition might still have its effect?

PANEPINTO: That is the reason I mentioned it in connection with a reel because I imagine the same thing might happen in a drum, although you have

mechanical action in a drum that might give slightly more penetration than in the other case. I think the condition probably exists there too, in certain cases and at certain times.

WILSON: I would like to ask Mr Cares, do you consider this problem an important problem in the liming of sheepskins, and if so, we would like to hear about it. If not, we would like to talk about some of the sheepskin problems.

C. T. CARES (John Flynn and Sons, Inc.): Personally, I have very little that I can add about liming of sheepskins. Most of us handle our sheepskins from the pickled state. About the only thing I would say to further this discussion would be a general idea of how sheepskins are handled in the lime.

Sheepskins are handled a little differently than most of the other leathers in that the wool is probably much more important to the sheepskin men than the hair is to the heavy leather men.

The wool is removed from sheepskin by painting with a lime and sulfide solution. Here the paint is painted on with a brush on the flesh side and the skins are folded and left for varying periods of time, depending on conditions. Extreme care has to be taken that the skins do not heat, because they can be ruined very easily.

I do not want to go into details but the skins after being painted and folded are generally left for twenty-four hours, after which the wool is pulled out. All the wool cannot be removed that way so the skins go back into a lime or sulfide solution again, for varying lengths of time, depending on the process.

A general beaming process might be as follows: the skins, after they are pulled, go back into the drum with sulfide and lime at a temperature of around 70 degrees Fahrenheit, using a skin ratio of three to one. And they are left in the lime for forty-eight hours.

They are turned over occasionally. Then they go on to the deliming and bating, the same as is done in heavy leather. I had hoped there would be somebody here who is familiar with liming of sheepskins, but as yet I have not been able to contact anyone. I would like to ask if anyone in the audience is familiar with liming sheepskins. If so would he have something to say on this?

BERNARD: What type of sheepskin—domestic?

CARES: We usually speak of domestic or New Zealand sheepskins, but it would be interesting to hear comments from you in Gloversville on your hair sheep.

BERNARD: On hair sheep we follow the same procedure pretty much as suggested by Mr. Cares. However, we have always stayed away from leaving the skins for twenty-four hours in a painted condition, as we call the using of

sulfide and lime. And there again we find that if the lime and sulfide are slaked together we get a much better result than if we just slake the lime and add the sulfide afterwards.

The paint is applied with a machine. It is built like a big conveyor with a rubber apron and the skins, after they come from the soaking and washing, breaking, trimming and so forth, are spread out on this conveyor with the flesh side up.

This machine has a large steel roller that runs in a trough of sulfide and lime solution paint. This paint is knocked off this roll similar to a seasoning machine except there are no brushes on it. There are rubber flappers which, as the skin passes underneath on the conveyor, knock down the layer of paint off these flapper rolls which run pretty fast. They knock the sulfide paint down so that you can get a coating of the paint on the flesh side of the skin. You have operators on the front and back and there are usually two men feeding and two men taking off.

You take off on platforms. The men wear aprons, rubber gloves and goggles, and they just face the skins. We find if the skins are left overnight, that the climatic conditions, especially during the summer months, cause damage to the skins, especially in thunder storms and humid conditions. We find that climatic conditions during different seasons of the year vary so that it is difficult to get a uniform process. We therefore make the paint strong enough so that the skins are unhaired in three to four hours after the painting operation.

And of course, these skins have to be either limed or sulfided, as you care to treat them after painting and unhairing. We have done it in various ways and with sharpening of sulfide and so forth. But we also find one problem that enters into the liming of a skin. The first thing, of course, is to make good leather, and over the years I have seen a good many methods used.

I used to work in Racine years ago and we had an old pit system and they figured they had to use old limes there. But in all the lime systems I have seen, it seems that the fine hair is one of the big problems in liming. The cost of the unhairing operation as compared with what you get for the hair determines whether the hair shall be saved or burned.

I notice with certain systems of sulfiding, we have had much less fine hair than with some of the other systems.

I know the quality of the leather is the first thought and there are many ways of getting hair off skins nowadays, with all the different materials that you have to work with. But I have one question to ask Mr. Henrich: we find considerable change in treating skins all the way through the mill, in the summer and in the winter. I know that Philadelphia gets to be very hot and humid in the summer months. It occurs to me that possibly the temperature in those drums must rise sometimes to 80 or 85, or maybe above that, if the room temperature is that high.

I wonder if you have any correction, or if you have any way of cooling the

rooms or the drums when they get too hot. I believe when the temperature gets above 80 or 85, you are getting beyond the danger point.

HENRICH: It does get hot in Philadelphia in the summertime. But what we do is this: we run at 80 degrees. That is our standard. In wintertime, we set our skins in the limes at somewhat higher temperature, say two, three, or four degrees, depending on how cold the weather is.

In summertime we do have a refrigeration system for making cold water and we set that stock at about 78 degrees. We find that with the stock cooled down and the drums closed, that in four days' time we do not get too much of a temperature rise, even in very hot weather.

BERNARD: Do you at times during the year have trouble with short hair in liming?

HENRICH: I would say that our trouble with short, fine hair is mostly confined to the winter months when it is a little bit cooler. Although on an average we do not have too much difficulty, we do, nevertheless, have some.

WILSON: I think that particular question leads directly to the manufacture of calfskin, and I would like to ask Mr. Martin what his fine hair problems are and how they fit with respect to liming and removal of hair.

MR. C. A. MARTIN (E. Hubschman and Sons, Inc.): There have been a number of problems brought up and I would like to start on the last one, talking about the heat.

We do not lime in drums. We lime in reels. We have the same condition in Philadelphia. It gets hot. However, we have a refrigeration system and we make ice. And we keep our temperature controlled with ice additions.

In the wintertime we have unit heaters throughout our two lime rooms and control the temperature in that manner. They are going day and night and we keep the temperature quite even.

There is another point Dr. Panepinto brought up on liming that comes in here. We have been trying another lime that chemically is almost the same. On a few experimental packs it worked very well and we thought it was a possible replacement or new source of supply. However, as I told you, when our skins go into an old lime first and they are then pulled or drained, we start on fresh limes.

On the experiments it went into the regular old lime and on the new lime we tried it out and saw no difference.

So we were of the opinion that things would work out all right in a change of lime. However, there was a truckers' strike in Philadelphia, and we did not get our normal supply of lime and had to switch over. We had problems there that we had never had before. The lime, instead of being a light grey, was a

very dark grey. The hair going through the washing machine felt very sandy and on top of that, we had quite a bit of trouble keeping an edge on the fleshing machine blades. That came about with a change in lime that chemically was supposed to be the same as what we had been using.

Now, talking about fine hair: we are old fashioned and have hand beamsters—thirty of them. It is very seldom that we have any hair showing in the finishing department, or any stages afterward because the beamsters are there for the purpose of getting rid of every bit of fine hair.

BERNARD: Do you unhair by machine first?

MARTIN: That would come in the mechanical work in the beamhouse. I know that these calf tanners will vary. However, when our skins come out of the lime, the first thing we do is unhair. The next thing we do is cheek. We then flesh and after fleshing, we put the skins on a small drum type scudder and from the scudder they go to the beamsters. When they leave the beamsters, there is little or no hair left. Occasionally we will have trouble as winter weather comes along. We may have some difficulty but we make adjustments with our sharpening agents to take care of that.

The only trouble we actually have with fine hair will come from stock that is supposedly a good grade of raw stock. However, when you are buying French skins at times you don't get exactly what you think you are getting. And those skins have usually given us trouble with fine hair but that is the extent of our fine hair troubles.

BERNARD: How many days in the lime?

MARTIN: Seven days.

Now I think with some of the other calf tanners here it may vary from three to four or five.

BERNARD: I would like to question you regarding the seven-day liming for the Saturday and Sunday operation—just how you work that.

MARTIN: We soak the skins early Sunday morning and they are fleshed on Monday and come out of lime on the following Monday. We have found we have been able to do it in six days, but cannot see any sense in saving that one day and paying overtime on Saturday for fleshing. So we still stick to our seven day system.

BERNARD: You unhair six days, do you, or five days?

MARTIN: The skins are soaked Sunday morning. Monday morning we will green flesh and the following Monday, the skins are out for unhairing and

fleshing—in seven days. We will make the adjustment to six days in case of holidays coming during the week, but not on a general run because Saturdays would be a time and a half day, as such.

P. H. WAITE (A. F. Gallun and Sons Corporation): I would like to ask Mr. Martin if he has ever noticed a bit of a hair problem where the skins have been creased in the piling out of lime. We have been plagued with this problem these many years and I have noticed it in other tanneries. Even with hand beaming it seems a difficult thing to get them out. I have reference to a pinch more or less, as you pull and pile skins out of lime. It does not take very much of a pinch, either, to make it very difficult to remove the scud and hair from this area that has been pinched, or else it is in the area in between the pinches. I don't know which it is, exactly. Have you noticed anything on that?

MARTIN: No, we have never had any difficulties from that standpoint. We have had streaks of hair where we would have trouble removing it—on New Zealand skins particularly. There would be a definite hair line left running from the butt to the head along the backbone, but we have had no trouble with pulling out of lime before being unhaired. From that point the skins, the minute they are out of lime, go to the unhairing machines—to four units and they move through there quickly. In running 4/5's, operators will unhair 220 the first hour. That is their production rate.

WAITE: How close to the machine is your stock—a few skins?

MARTIN: We have four units as we call them—that is the unhairing unit, the head splitting, the fleshing and the scudding. If we have four limes coming out the men will pull the skins out and divide them as evenly as they can and send them to the four groups. The skins do not sit in the beamhouse. They might be on a truck for an hour before being used, but we have experienced no difficulty there.

WAITE: If you take the skin right out of lime and carry it over to the machine and unhair it, you are all right, but as soon as you let it stand for fifteen minutes, you are in trouble.

WILSON: Are the ones on the bottom of the pile worse than on top?

WAITE: Yes.

WILSON: That happens on side leather, too.

MARTIN: That trouble we have not experienced.

WAITE: You are most fortunate. I am aware of the scudding machine lime being squeezed into the skin also. Does anyone have additional ideas?

BERNARD: I have ideas on pinching I have found on certain types of skins on the fleshing machine, or the scudding machine. You are referring to pinching?

WAITE: Merely on piling as you pull out of lime and pile on a platform. It is difficult to get the hair off at the points where the folds in the skin occur.

BERNARD: We have found a condition that varies with the water, especially during the summer months when the water changes. We use pond water which changes quite a bit during the summer, especially after thunder storms. If we do not treat the water, we get a rough, draggy condition on the surface of the skin. During the winter we have very little of this. In other words, the skins come out of the sulfide and lime, or the sulfide process and they will have a slippery, almost soapy feeling.

In the summer months the skins get a rough draggy feel—almost a raspy feel. And at times those skins will drag enough on a fleshing machine so that instead of sliding out and straightening themselves in front of the machines, or the cylinder, they are apt to cut. Sometimes we have had a semi-circular cut from that and we can also figure if we have washed a little too long, that the skin has turned rough. I do not know whether the skins you refer to have been washed in that condition. That makes them a little rough, possibly, and that is why they do not straighten out. Could that be?

WAITE: No. You can take the hair off but you still see the mark. All you have to do is to fold the skin and put a little pressure on it and you have got it. Once you've got it, of course, you can put it in warm water and help it a little bit, but it seems to be a very difficult thing to have the skin hydrate back at the line of the fold. There are a couple of depressions in the skin where you get the fold and you cannot seem to remove the hair at that point.

Actually, do you make any special preparation in piling them out of lime?

MARTIN: No, just pull out of the reels and throw them on the trucks. Of course the hand beamsters take care of a lot of the hair trouble as far as we are concerned.

WAITE: It is pretty difficult to get out even with hand beaming.

MARTIN: After the skins have come from the scudder they are taken up and distributed to the beamsters and thrown into tubs of water. Of course, that will rehydrate anything that is pressed down and at that point we have very little trouble. The skins are very wet as soon as they start working on them.

WAITE: Do you ever notice these marks before hand beaming?

MARTIN: I have never noticed them. We have never had that trouble. When I say that the beamsters take care of the hair troubles, leaving hair on as far as we are concerned, is a factory damage. They are not a hundred per cent perfect. We have men checking the work of the beamsters and the skins not properly cleaned are returned to them. I will say this: when we have black skins we do have more difficulty.

WILSON: How long is your liming period?

WAITE: Five days.

MARTIN: May we ask this question: Can any of you help out Mr. Waite?

J. L. IVANY (A. C. Lawrence Leather Company): I am afraid my contribution to the fine hair problem is negative. Most of my esteemed colleagues know that we use a painting process similar to the one described by Mr. Bernard which, of course, means that we have no hair problem whatever. After soaking, we paint the skins and after a few hours we unhair and we throw them in the limes in an unhaired condition. Our liming period is around forty hours, which, of course, helps to remove any hair roots which might have been left over after the unhairing. After the skins come out of the lime, there is no further problem as far as fine hair is concerned.

Now, as far as lime temperatures are concerned, some reference was made to it in connection with the kid processing. I do not know how fussy they have to be about it there, but we found that to be one of the most vital points of control. We are fortunate enough to have well water with a temperature of around 58, the year 'round; which means that during the summertime we set the initial lime temperatures a little lower and during the wintertime a little higher.

In the wintertime of course, the room temperature is controlled within two or three degrees, so that at all times our lime temperature is held at 70 degrees, give or take one degree. And we found this to be extremely important, both on the high side and on the low side.

As far as sequence of operation is concerned, mentioned by Mr. Martin, ours are identical with his with the exception, of course, that we do the unhairing before we put the skins into limes. Therefore the checking or head-splitting comes before lime fleshing and scudding.

One thing that may be of interest is that the quality of the hair gained through this painting process is definitely inferior in view of the fact that you cannot keep sulfide away entirely from the hair, with the result that some destruction takes place.

This process, as most calf tanners know, is the process used by practically all European calf tanners, and they go through a great deal of expense to save and improve the hair.

R. LOTZ (A. Trostel and Sons Company): How long do you drain your skins before you paint them?

IVANY: This is an important phase of this whole process. If you want to avoid swelling caused by the paint, you have to bring the skins in as dry condition as possible to the painting from the soaking operation.

In Germany, for example, where they have a little cheaper labor than we have, they horse up the skins after the liming for as long as twenty-four to thirty-five hours, to make sure that as much water is squeezed out as possible. We had to make short cuts and we do it by draining the soak water, about six to eight hours prior to the removal of skins from the pit. The pressure on the skins obtained in the soak fleshing takes out enough water so we have the proper moisture content for painting.

LOTZ: You are probably using a minimum amount of water on your soak fleshers?

IVANY: Yes.

LOTZ: And you get no effect from the water used in fleshing at all?

IVANY: No. If we would, we would be in deep trouble.

BERNARD: We have not paid too much attention really to the condition Mr. Ivany speaks of. During the painting and directly after the painting and unhairing operation, which incidentally we find we pretty nearly have to do by hand— we have to push the hair off by hand—we do not have to but we find that, with a machine, the machine squeezes the paint and the hair all together and in a very short time the hair becomes attacked by the paint, plus the fact that there is always a certain amount of grit with the machine and you always find a certain amount of grain damage.

You find after the skins are too far along to do anything about it that they have been scraped in the unhairing machine. We use different types, the rubber blades and so forth, but we still have the old fashioned method of unhairing by hand over the beam, on the treated skins. We use a certain portion of lime and sulfide which is slaked together in a certain way and we always feel we have to have a certain strength to get the action in a short period.

Because we feel the factor of leaving them too long can affect the skin very much, in other words, as soon as the skin is ready to unhair, we feel the hair should be taken off. We feel that after-treatment, however, of how strong we

make the sufide, and whether we use sulfhydrate, control is by the moisture in the skin. We try to leave the skins as long as we can, but we try to control the swelling by the use of sulfhydrate before the skins are sulfided; and the more sulfhydrate used in relation to the sulfide, we feel we have less swelling. Actually we have made no direct analytical tests on this but we are going on this theory and I believe it works out.

WILSON: I notice in the discussion of the last half hour there has been some talk about swelling. It has been said in the past that many of the fundamental characteristics of leather are built into the leather in the beamhouse. May I suggest now as a discussion topic, swelling, and other aspects of liming in relation to the leather qualities, and may I also suggest that Bob Lotz enter this discussion from the side leather viewpoint, together with Charlie Martin.

The reason I say that is because I think, as far as I know, the most important quality to them, or to one of them, is break. How do the beamhouse variables go along with this quality they are looking for—break?

Charlie, we have been talking about removal of hair. Let us think about break for a while now.

MARTIN: When you are talking about your sharpening agents, we have been using arsenic for many years and still do. As a result of that we start with a very mellow lime and the arsenic we add in the fresh lime does not give a high alkaline lime. There is no sodium present in our limes at all. For that reason there is a slight swelling during the course of the liming, and plumping. There is no excess plumping and it has been our opinion that this is the liming we prefer. We have tried other sharpening agents but always go back to the arsenic.

I know other tanners here use other things and may get different results. In their processes they may do things differently than we because of the type of liming they have used.

Ross (Ohio Leather): The other calf tanners have briefly discussed their liming processes and it looks as if ours is the shortest—a three-day liming period. One particular aspect of our process on which I would like to promote a discussion is that we do one thing in the process which is contrary to theory. We add some of our sharpening agent—sodium sulfhydrate—the second day.

I can remember Dr. Windus telling me ten years ago that this wasn't right. Don't pin me down too closely as to why we do it, but we do think it gives us a better piece of leather. Are there any other side or calf tanners who add any sharpening agent the second or third day?

CHAIRMAN MORRIS: The reason there would be to minimize the swelling of the grain?

ROSS: I would not say that. Sulfhydrate does not swell too much. We think it helps remove some of the fine hair that Charlie mentioned before. We do not hand beam and we naturally have a little fine hair, but we certainly take care of it with fewer than thirty people. From an economic point of view I cannot quite see how Charlie can account for the thirty people. I would like to ask Charlie now, 'Do you think you gain anything more than merely taking care of the hair?' I assume you do. If you do not care to answer, that's all right too.

MARTIN: Let me answer this way: These men—the number has gone as high as thirty-three—when we are running the tannery on an overtime basis—it may even go lower—however, I can assure you that we would not spend in excess of $100,000 a year just to take off that hair. We definitely feel that we gain by it, from the standpoint that our skins are cleaner, they are in a better condition for the very light pastel shades and the various colors we make. There is very little black leather. We work entirely on color and we feel the beamsters contribute toward that. We would not do it if we did not think it was of value.

ROSS: Trying to get something going here on break, in respect to swelling—years ago Ohio used sulfide, which naturally swells more than sulfhydrate. But we did not give up sulfide and go to sulfhydrate because of break. Sulfide and sulfhydrate are quite different as far as swelling is concerned. The sulfhydrate does not give us any better break than the sulfide but we get less draw and fat wrinkles with the sulfhydrate. I was wondering whether anybody else would like to talk about break in relation to swelling.

In other words, we think swelling does not influence our break too much.

WILSON: I would like to have discussion on leather qualities. We have been saying that the leather is better. Better in what way? What qualities specifically do liming variables affect and how do they affect them?

ROSS: That would be one important one, in going from sulfide and sulfhydrate. Sulfide liming gives much more draw than the sulfhydrate. That is one specific leather quality that we made the change for.

J. KOENIGER (Blanchard Brothers and Lane): When you say "break in the calf," you must mean looseness?

WILSON: Yes.

KOENIGER: We call it looseness. We have two different systems. We run a two-day quicklime and a regular five-day liming series and from this leather we see no real difference. We get a little more draw out of the quicklime, but we see the same amount of looseness in one as against the other.

CHAIRMAN MORRIS: In this discussion and elaboration of cause and effect of various treatments, I think it would be interesting to hear something from Bob Lotz on side leather.

LOTZ: I do not think in side leather we are quite as concerned with the grain characteristics of the leather as it is made in the beamhouse, as, for example, a calf tanner or a kid tanner. Most side leathers are corrected. We want our beamhouse to hold the break and plump our stock. We do not care so much about the flatness of the grain.

In the beamhouse in our tannery we run the pH up as high as we can to get a maximum amount of plumping. We make a lot of heavy leather and occasionally have to work with a lot of light, scrawny hides. We use our beamhouse and chrome tanning process to get a maximum amount of weight out of the stock, knowing that in getting the weight, we often accentuate the fat wrinkles and the general grainy characteristics of the leather.

In later operations in the tannery, (buffing and so on), we can offset sometimes what our beamhouse does. In a side leather beamhouse, we probably have our first problem in the fleshing operation. Many of these heavy hides that we get today have a lot of fat on the back and it has been a perennial problem in the side leather industry with these so-called fat spots in the leather.

In our tannery we start our process in the beamhouse by a good fleshing job to get most of the animal fat and flesh off the back of the hide before we put it in the lime, feeling that getting it off we will get a better liming job and a better opportunity to plump our hide substance as much as we can.

After fleshing, most side leather tanners will have either a two- or three-day liming process. In our tannery we lime all of the stock under 60 pounds on two-day process, and all of the stock over 60 pounds on a three-day process,—unhair and reflesh to open up the stock for the tannage.

I would like to throw a provocative question on the floor and ask a friend of mine this: there is a tannery in the Midwest that does the best reliming I have ever seen. Some of us have a problem of fine hair and yet I do not think this tanner has a fine hair problem on side leather. Would Ed Thorstensen like to comment on the reliming of side leather?

E. THORSTENSEN (S. B. Foot Tanning Company): Bob likes to put me on the spot every once in a while. After listening to the discussion so far this morning, I think the old saying that there is more than one way of skinning a cat, is true. Each of us has a problem of our own as far as making leather is concerned.

When we are making leather we are thinking about what the users are going to do with it when we get through with it. I do not want to be put on the spot that one of our salesmen put us on one day. A customer complained about the leather and he said, "I didn't make the stuff—I only sell it." So it is not always so good.

When it comes to the fine hair problem and the various effects that you can get from beamhouse, as Bob said, the bulk of side leather today is corrected grain leather where a little fine hair is not too much of a problem. There is a percentage of full grain fine leathers, not only in the small spread, but the big spread also, and when you are working toward getting as many full grain as possible you must take that percentage of your product into consideration in your beamhouse, just as well as you take the larger percentage of corrected grain leather.

We have discussed everything here from calf, kid, sheep to side leather and while we were not going to talk about raw material, I do not know where you would find a greater spread of processes than the raw material indicates.

Another thing enters in with everybody, especially in the beamhouse, and that is water conditions. You fellows along the Great Lakes have a cinch as far as water is concerned. If you are on Lake Michigan you know you have nine grains of hardness and it will stay that way. And if you are on Lake Superior, it will be three. If you are using pond water, or well water such as Surpass has, you are fortunate in having water with a temperature of 52 degrees all the year 'round. However, our water has 30 grains hardness and we have to take that into consideration right from the soak on, into every operation in the tannery.

To get back to reliming, if I were to go back a few years—I hate to do that because I date myself too much—I know in one plant where I worked for many years, all of the various types of leather were sorted out, right after the hair was off the hide. Each particular kind was then relimed accordingly. The original process was a lime and sulfide process as is in common use by many people.

Today, these processes have been going through an evolution just the same as our medical profession is going through an evolution. You know a few years ago if someone had pneumonia, you practically kissed him goodbye. Today you put him in the hospital. and tatoo your initials on in place of a brand and he is out of bed in four days and well again.

If we do not keep up to date, we are going to fall by the wayside. In keeping up to date you have to bear in mind particularly your own home conditions. I remember some years ago—and I hope if I mention the name of a plant from which there is anyone here he will bear me out—there is a big shoe manufacturing company which has a tannery on each side of a track. They tried to make the same leather on either side of the railroad track by the same method, but did not get the same results.

To get to the point of reliming, I said that all leathers in this particular plant some years ago were run through the unhairing by the same process. They were all sorted and then relimed for various lengths of time amounting to one to five days.

If you are doing a paddle liming, you like to get your hair off in two days. If you are making certain types of leather, you won't go to reliming but if you are making other types of leather that you want to be cheaper, or you want a

little more swelling, or you want no hand beamsters around the place, the thing to do is to put the hides into a plain white lime and get rid of the alkalinity you carried over from the sulfide, then put them on a re-unhairing machine, built the same as the unhairing machine except with two blades very close together.

The only time we see any fine hair at all is when we try to make some very light leather from spring hides where new hair is coming in and the critter is shedding its winter hair. That fine hair is harder to get rid of than any normal growth of hair. But we have at no time found any real difficulty. Personally, I am a firm believer in reliming but you have to regulate the time of your reliming according to the end result that you are trying to get. I don't know whether that adds anything to your discussion or not, but I thank you.

LOTZ: Thank you very much. I would also like to mention that in side leather there are still some of us who do a little painting. I was very much interested in John Ivany's comments on calf. When we do have to make full grained kip leather in our tannery we paint and use a process similar to A. C. Lawrence. In this process we tend to get much less swelling and a flatter grain—more in the nature of a calf grain.

I wonder if John Ivany would care to contrast the grain that he thinks he gets from the painting process on calf with the grain gotten from other types of liming in calf manufacture.

IVANY: The comparison would not be fair. We paste everything and that certainly has quite an effect on the grain.

LOTZ: Does anybody in the side leather end wish to comment on the length of lime in their operations? As I pointed out we are using a three-day lime for stock over 60 pounds and a two-day lime for stock under 60 pounds. Would some of the side leather tanners like to comment on their length of liming?

L. MEYERS (Pfister and Vogel Tanning Company): I might add a little. But first of all I want to help put Charlie Martin at ease. He is not the only one who spends money getting the fine hair off. I am sure our competitors, Charlie, are very happy to hear that we spend considerable sums in getting the hair off. However, in the side leather business, as was pointed out by Bob, most of our leather goes into corrected grain and therefore, it is not necessary to fine hair all of it.

But we go through the laborious process of taking the hair off, after the leather has been chrome tanned. We sort our leather in the blue, and then cut it off with sharp knives. We have a small battery of men doing it (not as many as Charlie) and this particular time of the year is when we naturally run into it a little more.

Now as far as the time of liming is concerned, probably the best way would be, as Mr. Thorstensen pointed out, to sort this limed stock in the beamhouse after unhairing, and then give it a reliming. Naturally we have thought of that many times but always being cramped for space, even at the price of expansion, we have shied away from that method of doing it, and still go through the fine unhairing, hoping that our chemists in due time will come up with a proper solution of the fine hair problems. It is one on which many of us are working, I believe.

As far as time of liming is concerned, in answer to your question, Mr. Lotz, we use a two- and three-day process on all of our stock. The three-day process is only used as a matter of convenience over the weekend when we have a Sunday in between. Outside of that, the normal processes, at least in our plant, are just about the same as they are in any other side leather tannery.

On unhairing, there is no cheeking anymore—that has been discontinued; unhairing and then refleshing. We have found, however, that on a two and three day process we do have to delime and bate differently than we would for either one or the other. And in answer to something that was brought up before: in our two-day process, we add all of our materials the first day and on the three-day process, we add part of them on the second day.

LOTZ: I am interested in finding out why you add your materials on the second day in the three-day process.

MEYERS: It is an old custom more than anything else. The three-day lime is old with us and has been a good one. Therefore, we have continued on that basis.

LOTZ: I can tell you that in our tannery the two and three-day limes are not a matter of convenience. They are done deliberately and we are so scheduled that our heavy stock goes into soak on Wednesday, fleshed on Thursday, resoaked on Thursday, goes into lime on Friday, and comes out of lime on Monday,

We have been doing work on some material called carbide lime. It is a by-product of the Air Reduction Corporation of which they have literally thousands of tons. Our interest is that it is delivered in a slurry by a tank truck and the savings in our tannery amount to some $15,000 a year.

We run a considerable amount of leather through our tannery and find that the leather shows no significant difference over regular hydrated lime. Has anybody here ever done anything with the carbide lime slurry from Air Reduction?

MEYERS: We have not at our plant, but it brings up another point mentioned before regarding the use of lime. We do have two sources of supply which have been tested, not only laboratory-wise but through many thousands of tannery packs. We are maintaining these sources for a definite reason, that in case of a

strike or tie-up in one area we would have another source of lime. Outside of those two limes, we have not done any work recently on different limes.

WILSON: Is there anyone in the room who believes that the fine hair problem can be licked chemically?

BERNARD: I think so.

WILSON: I mean strictly chemically

SALAMATOV: Well, in our plant, due to the force of circumstances, we had to be non-conformists. At one time we had only three beamsters and all three went on strike. We had a lot of stock in the paddles which had to be taken care of. So there and then we had to come to a decision. The decision was made and we are moving definitely in the direction of trying to get rid of the fine hair chemically.

We are moving towards the more or less side leather type of beaming. We have concurrently, strange as it may sound, two different beaming procedures.

In both of these beaming procedures we, from time to time, run into a problem with fine hair. In Newark we cannot get beamsters for love or money. So when we started to try to develop beamsters of our own, it usually ended up with the very sad experience that there would be more skins damaged by cut and spoilage than by the hair itself. So we had to abandon that, too.

For this reason our present procedures are built up in such a way that we want to get rid of all the fine hair in the lime. As I said, it is very drastic and we do not worry too much about it.

One of the two procedures keeps the skins in the lime only two days, and the other for three days, which is a modified Hooker procedure. For the last six or seven years we have run occasionally into a fine hair problem and most of the time it is due, not to the processing, but to the skins because of their source and origin. Again, circumstances force us to put our hands on anything in a certain size of calf. We get them from different sources, and most of them go through without any difficulty. Once in a while we will run into a lot of skins which give us a lot of trouble.

But, by and large, I firmly believe that it is possible to modify your own procedure to such an extent as to be able to get rid of the fine hair in the lime. That is what we have been doing. I do not say we licked the problem a hundred per cent. We licked the problem probably 80 to 85 per cent.

By this I don't mean that in every pack we have about 85 per cent clean skins and 15 per cent with the fine hair. What I want to convey is that with 85 per cent of our packs we have no difficulties, but with some 15 per cent of our packs we ran into trouble of the fine hair from very insignificant to a very considerable extent, depending mostly upon the source and origin of the raw stock.

Another thing I would like to say is this: due to the fact that today we have to put our hands on almost anything we can get in the way of skins, the quality of the finished leather primarily, depends upon the quality of the raw stock—irrespective of the procedures, of course, within reason.

R. QUARK (Chemtan Company): I would like to ask the speaker what changes he has made to get rid of his fine hair problem. He says he has licked it but he does not say what he has done.

SALAMATOV: We just increased the amount of sharpness. That is as much as I am free to say.

TURLEY: I would like to say something in this field because I have been associated with it for about thirty years. I do not want to offend anybody and I do not mean it that way at all, but I really believe that of all the processes in leather making today not only in the United States, but in Europe, the liming is the poorest one that is done from the stadpoint of perfect control.

I believe also that with a satisfactory agent you can, in all cases, take care of fine hair but you must be sure to balance the process. When you take a low sulfide lime where you save the hair and all you want to do is to loosen it in the hair follicle, it requires approximately the old formula or one per cent of crystal sulfide which is one-third per cent sulfide and at a four to one liquor ratio gives us about one-tenth per cent solution of sulfide.

I believe if you take a certain type of raw stock and follow the percentages, I do not care whether it is sulfide or sulfhydrate, if you backtrack a bit you will unhair everything, provided of course, that you get proper soaking and you have good mechanical features. They are very important. So is the soaking.

What are some of the things that upset this? Well, if you do not have soaking under control to the extent that the washing is under control following that, you bring over into the next liquor varying quantities of protein matter—salt, even acidic materials, which have an effect on the small quantity of sulfide. The same thing would apply to cyanide. In the normal way you do not take care of that, and certainly the workmen do not. So on a particular lot of skins—perhaps foreign skins which in every respect are desirable, but they just give trouble—if the effective sulfide is studied and brought back again to the optimum quantity, I feel certain from experience that you do not have fine hair trouble.

I would like to mention something that Chet Ross brought up—the question of whether you add materials the second day. Of course there are differences. It is something along the lines I was just discussing. Suppose you take domestic packer calf and you have found that with about a half per cent of the sulfide concentration with the temperature you are using, and three days, you might want to add a little more sulfide to help the unhairing, then you run into trouble with an attack on the hair, and then you run into fine hair because of the mechanical action. So, it is a fact if you want to increase say twenty-five

per cent more sulfide, you could not do it by adding it all at once. But if the original amount or even less, of the amount you are going to use, is added the first day, the skins take up some of it, the epidermis takes up a part, and the skins also take up some of the alkali, you can then add the balance of sulfide on the second day and you won't get the effects that you would have had if you put it in all at once. It is not ordinarily a major point, but it is a fine point if you are making a fine leather.

Side leather does not usually come into the question. The grain is taken off or it is split and you would never see the difference. But I am speaking of fine leather.

I think the fundamental question on this whole liming regarding calf is: "to swell or not to swell—that is the question." We should also bring out whether there should be high sulfide and high plumping or low sulfide and low plumping. For many years I thought that the result of the leather in calf depended on the amount of swelling in the beaming process. In the last few years I have begun to doubt that and I feel that possibly an ideal process is perfect smoothness; no unnecessary roughness in the beamhouse, and obtain the fullness of the leather by the tanning operation. There are great effects to be got in tanning.

Mr. Koeniger does not see any difference between the one and five-day process of liming. He makes a vegetable leather with thirty per cent tannin in the fiber. Charlie Martin may only get three or four per cent. His problem is to make three or four per cent chrome against a thirty per cent vegetable. So he must have his technique right to get his whole skin in shape.

So we have to make sure in talking about this not to lay too much on the beamhouse but to consider the tanning operations and then, of course, the fatliquor.

I believe the day might come when there is more uniformity in the rather important operation of liming. It is not just taking off the hair, but also conditioning the skin. And we may work eventually to mild processes, perfect unhairing, no fine hair, no distortion of the ribs, no differentiation of the flanks and an inherently smooth grain. If the industry can do that, then in the future the changes of characteristics of leather can be done properly with a less number of variables by paying attention to the broad field of the tanning processes.

M. H. Battles (A. C. Lawrence Leather Co.): We discussed fine hair and a number of other characteristics of leather which result from the liming process. There is one characteristic of side leather and particularly sole leather, which can be affected to some degree by the conditions of the lime. Dr. Koppenhoefer pointed out in some of his work that the lime is the only step in our processing where marked changes can be made in the natural fats. In recent years it is assumed that through a different method of feeding cattle, the hides

coming through to the sole leather tanner and the side leather tanner are becoming increasingly greasy.

Dr. Koppehoefer pointed out that an increase in the sulfide content of the lime increases the degree of saponification, and the degree of the removal of fat. I should like to ask Mr. Kay to comment on the effect of the lime on the grease in sole leather and perhaps other members of the sole leather group here have some remarks to make.

A. N. KAY (Howes Leather Company): That is a leading question.

BATTLES: That is what I intended it to be.

KAY: The problems of greasy bends has been with us increasingly every year, undoubtedly due to the feeding. Associated with that defect there is the defect which we know as grain cracking—small fine cracks in the grain, which develop in the process and which throws your leather down in quality or saleability. I suspect the two are tied together.

Now, on the question of getting rid of the grease in the limes, I do not know of any way in which you can get rid of it and still make leather. You see, we are in the unfortunate position, as Dominic Meo said of the people next door last night—we are "orphans" in this business. The calf people want a nice smooth grain, but also what they would consider a flat leather; the side people want a plump leather and don't give a "hoot" for grain. Unfortunately we have to have both. The condition which Dr. Koppenhoefer suggested for the saponification of the greases is inimical to the type of leather we have to produce. I do not know the answer. Do we have any of the sole leather people here to comment?

G. W. COLLIN (Virginia Oak Tannery): In connection with the problem of fat, the speaker before me had reference to the study by Dr. Koppenhoefer. He pointed out that the conventional type of process using the conventional amount of sulfide or sulfhydrate is not enough to saponify the excess of fat which the hides might carry. Of course by increasing the sharpening agents you will get increased saponification, but at that time a destruction of hide substance will occur. So that leaves one alternative to get rid of the excess fat by special processing—whether it is in the wet stage of the skins, the way the sheepskin tanners are doing it, or whether it is in the finished leather, by using some type of solvent to degrease those bends and increase their value.

We have done some investigations along this line and we have found the most economical way of degreasing heavy leather is in the rough stage, or preferably after the rolling. Some of the grease comes back to the grain after the skins have been rolled. So we are taking the greasy bends after the first or second rolling, and possibly not before finishing, and then we give a solvent bath overnight, depending on the amount of grease we want to remove, after which the solvent is dried off and the leather can be finished without difficulty.

KAY: Thank you, but Mr. Battles wanted to know what processes we can use in the beamhouse.

Listening to the conversation from the light leather people, it seems to me, as it did in the previous symposium two years ago, that the problems are universal. We all have the same problems of fine hair, (if we are honest about it) and the problem of water character. The question of slaking of lime is most important—we have done quite a little work on that.

We have found, to extend Mr. Humphreys' remarks, that any individual lime demands its own slaking conditions. There is the rather solid limestone; it is, therefore comparatively slow slaking. You add water to it and it takes a measurable interval, even with a ground up powder, to start the slaking. Once it starts, it goes quite rapidly. On the other hand there are porous limestones which start slaking immediately and you cannot add the water fast enough. Conversely, there are limes of both types, porous and non-porous, which demand boiling water to start them slaking, and they slake very slowly.

I believe that the condition of the limes themselves is a basic principle in the making of leather of all types. I think it is one of the most important. If the stock is not right there, all through the rest of the process you are jumping back and forth trying to correct something which you should have done in the first instance.

Hydrated lime, for example, has a slow settling rate. In our tanneries we have used hydrated lime, a hundred per cent. We just emptied the bags in, stirred thoroughly in the vats but the stock that comes out was flat, empty and dead. We ran into unhairing troubles and color troubles. As soon as we got back to the slaked lime, those color troubles largely disappeared. On the other hand, I have been told that, if you take a hydrated lime slurry and boil it, the colloidal characteristics of that lime suspension are very much improved. I have not tried this.

I do not know whether that would bear on the remarks of the gentleman in the audience. There is another point on his question about slaking of limes—measuring the settling rates of lime suspensions. The settling rate is dependent on the concentration among other things. If you have a one per cent solution, you may have 90 cc's of clear liquor in one hour, with the rest of the lime at the bottom. If you raise that to five per cent, you may only have 50 cc's of clear liquor with no change in the lime itself. In other words, concentration is a prime factor in the character of the lime suspension.

The question that I mentioned in connection with the greasy bends—the grain crack: I wonder if not only the sole leather tanners but the side leather, too, might have comments to make on that.

C. A. LAUDER (Wickett & Craig, Ltd.): We make principally luggage leathers but we also make raw hide. We noticed, on our raw hide, deposits of natural oils or fats; and we found out that when these deposits occurred we were making an error of applying too much pressure in the fleshing machine.

I wondered whether applying more pressure on the fleshing machine would rid one of some of those oils and fats in the beamhouse.

KAY: I cannot answer that. I have not tried that.

KOENIGER: We make heavy flexible bends and though we use a great deal of pressure on the fleshing machine, we still get heavy grease over the kidneys on steer bends.

LOTZ: In our tannery we have gone to harder rubber rolls in our fleshing operations because of this.

KAY: Has it improved it?

LOTZ: It has improved it.

LAUDER: Another question: we have a condition in our vegetable leathers of untanned hide in the center and we have changed from sodium sulfide to sodium sulfhydrate. We are wondering if, in the use of sodium sulfhydrate, we should add caustic soda, or go back to sodium sulfide to assist us—that is, whether getting more swelling would assist us in tanning our leather through the center. We pull our leather in a tan yard, in eight-vat series, for twenty-eight days, moving from the tails up to the heads over a period of between three and four days for each.

KAY: That is a borderline question because the rate of penetration will depend on the concentration.

To me at least, it would be logical. You have to open the hide out to some extent. Otherwise you leave materials in there which inhibit penetration. I am not familiar with the type of leather you produce, but my suggestion would be that you might find it advantageous to use sulfhydrate as your unhairing agent in the early stages of liming and use the caustic later to get the additional swelling without hydrolytic action of the sulfide.

COLLIN: I just wish to make a remark with reference to the pressure of the unhairing machine as related to the fat stains. As far as I know, before the hides go into the limes, the grain contains approximately twice as much fat as the underlying corium. This ratio is changed after the liming process, after which the 60 or 70 per cent of the fatty matter from the grain has been removed by saponification in the limes while only 30 per cent are removed from the underlying corium.

Now we have found that if we put excessive pressure on the scudding machines, or on the unhairing machines, that grease content from the corium is pushed into the grain and on those parts the tan liquor does not color the grain

and you are getting white spots out of your vegetable tanning. We overcome the situation by easing up the pressure and by not pushing the grease into the grain.

F. EDMONDS (American Cyanamid Company): I think I might add a little bit on that. We tried using the sulfhydrate in the vegetable tanned leather. We ran into the same condition. In other words, the extra alkalinity that was given to us by the sodium sulfide was just enough to open those hides up so that the tan penetrated much more quickly and we did not have that trouble with the untanned portion.

KAY: That points up the suggestion by other people—that a lot of these details are matters of local consumption, so to speak. It depends so much on the conditions in your rockers. Some people can get by with sulfhydrate entirely and others have to use sulfide or a mixture of both, as I believe Mr. Bernard and other people have found. They can do this either together with, or separate from, but associated with the caustic.

Are there any comments on the grease situation, aside from the fact that they have it?

BERNARD: It seem possible that the temperature of the limes could affect the fatty condition. I know if you get the lime too high or too long you might have a condition existing there. Also as I understand it, not from the really technical standpoint, but from the viewpoint of the practical tanner, that there is a bacterial action that takes place in the limes. I do not know whether in the condition mentioned they used old limes or new limes and if they used old limes, if they were properly reduced in the summer months, also whether the temperature gets above a certain point. I think either one of those factors could definitely affect the grain cracking. I think too strong a lime sometimes is considered to have a harsh effect on the grain.

I look back over many years ago where we used the old limes and more or less the method Mr. Martin uses today, where we felt that we had to have a week-old liquor to mellow the grain and not swell and make the grain harsh. I do not know whether that is of help to these gentlemen on that angle.

I would like to inquire what the temperature of their operation is and how many days they have in the lime. Also, the effect of washing after the liming, and the condition of the water which can have an effect on how strong the grain is.

KAY: I am speaking, I think, for the majority of the sole leather people: this crack is a relatively short one averaging about two to three inches long, irregularly distributed over the surface of the leather, but usually in the butt portion. It comes in streaks, so to speak. You get a lot of it now, and then it

disappears. It tends to be associated, in my mind at least, with the chunky type of hide which is most susceptible to grease stain also.

It seems to be accentuated by mechanical operation. In one of our tanneries we did find some after the bate. You cannot find much of it before that. And it becomes progressively worse with each successive mechanical operation; which implies, in my mind, a weakness underlying the grain.

I doubt whether there is much bacterial action in the modern sole leather lime. We do not use the old limes that you implied. Our limes are usually low plumping, with the amount of sulfide that Dr. Turley suggested. Temperatures normally are from 70 to 75 maximum, occasionally going up to 80 in the warmer climates. I do not know the answer, myself. I do not know how to evaluate your suggestions at the moment except that I do not think that it is bacterial limes, *per se*. I do think that underlying weakness below the grain—that region where the cure reaches last—just below the hair follicles is more susceptible to any kind of damage. We are trying to look into that. You cannot see it, usually, until it is too late in the process. The defects are masked by tanning agents and what have you, and it is a difficult problem to sort out.

CHAIRMAN MORRIS: Would you suggest, then, Mr. Kay, that the grease content in that portion of the hide might be correlated in the sense of the thoroughness of the cure?

KAY: Yes and no. It does not necessarily occur in those bends which show kidney grease, but tends to be associated with that type of stock. If you get a lot full of kidney grease you usually get the grain crack, but not in those which have the actual kidney grease. But I think the cure is delayed sufficiently to initiate a weakness. Your liming conditions, as Dr. Turley pointed out, are not under the best of control.

You have a mass-production method of handling stock when it really demands individual handling to get the optimum. I think we are accentuating it throughout the process. If you have a delayed cure, then that hide will further weaken, whereas the normal hide will not be affected. Your production may go through quite happily until you get a batch of hide with weakness to start with and then that is just too much, or the last straw, so to speak.

COLLIN: We have noticed occasionally those small grain cracks you have mentioned and I am under the impression that this has something to do with the poor cure. We followed it out and almost in every instance it pointed to poor cure.

G. V. DOWNING (Leas and McVitty, Inc.): We see the same thing, of course. We find it to be more prevalent in the heavy and greasy bends. The light bends apparently are not under the same mechanical stress in reeling. I will have to get together with Art later on and see if he will give me actual figures on percentages, because we use sulfhydrate in the limes and he uses sulfide, I gather.

KAY: We use both.

DOWNING: Do you notice any difference between the sulfide and sulfhydrate? I was wondering whether excessive plumping or less plumping in the sulfide might have an effect?

KAY: We have two tanneries undergoing quite a siege of this at the moment. One is using sulfide, not excessively and the other is using sulfhydrate.

DOWNING: It is perfectly true this condition varies and is probably worse on the winter hide than on the summer hide, and we attribute it to the fact that we get a poorer beamhouse clean-up. We do not know what to do about it and it runs into a serious problem for sole leather people on certain lots.

KAY: There seems to be a contributory mechanical effect. The more mechanical action you give, the worse it gets.

DOWNING: We followed lots in the beamshop through the wash wheel and the tanning and oiling drums, and there is a gradual increase. On some lots it is worse than others. Taking lots of the same hide we do not always get the same increase.

KAY: And yet it seems to be within our control. I mentioned we have one tannery using sulfide which has a bad siege of it. We have another tannery 400 miles away also using, I am told, identical hides—coming from the same shipper and probably from the same shipping packs. That tannery is also using sulfide and the analyses of the lime liquors are as near normal as one can hope to get, and that tannery has none.

DOWNING: That is very fortunate.

KAY: It is fortunate. That is where I think the mechanical action comes in. If one envisages the suggestion I made that there is a weakness below the grain or the hair roots, any mechanical stress has an effect. Since that is under our control we must be accentuating it in the limeyard somewhere. Granting that, where can we get mechanical stress? The first thought is the machine.

If one surface of the leather is trying to go at one speed and the other surface at another speed, that introduces stress immediately. One of our tanners told me that one time they traced a similar defect to the fact that they had not taken seams off the bags around the rolls. Where the hides went over the seam, it popped. So it looks as if it is partially within our control, at least. It cannot be blamed altogether on the cure.

DOWNING: Some years ago Ted Oberlander endeavored to make a study of the strains set up in the drying. He seems to think part of the crackiness was due to the natural differences in tension over the different parts of the hide, as it was drying.

KAY: Except that you are not drying the hides in the beamhouse.

DOWNING: Correct.

A. M. LAMBERT (Chemtan Company): So far we have discussed only longer methods of liming for comparitively weak liquors being used. In this part of the United States we are using mostly a short liming process of between twenty-four and forty-eight hours. During that time we have worked with higher concentrations and in these situations there has been caused considerable draw. Now, our work is to eliminate or minimize these sulfide draws. We worked with sulfide and sulfhydrate. But so far we still have in the heavy steers a heavy draw which is very objectionable. I would like to bring this up for discussion. How can we minimize these draws, especially in the bellies and the shanks?

CHAIRMAN MORRIS: That brings in another one of the factors of cause and effect which is somewhat pertinent to remarks made heretofore, that the process used in any particular tannery or locality may be arrived at by the necessary conformation to conditions or facilities available in that tannery. The stress is quite frequently toward shorter runs and toward more highly sharpened limes or concentrated unhairing solutions.

As Dr. Turley mentioned, the trend seems to be in the general direction of more mellow limes or less drastic sharpening action. This he feels is due partly to desirability of not distorting the grain layer. Also this might, in a shorter process, bring in the factor of drawn grain. Can we have some further expression on that?

THORSTENSEN: This question of drawn grain seems to be a little ahead of the subject we were on. I would like to add something about stresses and strains.

When you opened the meeting you said we were to stay off the soaking and the raw materials, but we have taken a shot at it here and there. I want to just make a few remarks in regard to these heavy steer hides.

The sole leather tanner is not the only one who has to contend with these. When we buy hides we have to take some of the hides over 60 pounds whether we like them or not and to make upper leather of them. We run into the same trouble that you run into in the sole leather business, with grease.

During the past several years, where the cattle raiser has gotten a pretty fancy price for his cattle, he puts them on the feed lot and stuffs the cattle with corn and soybeans, and naturally they put on a terrific amount of kidney

grease. That grease is present not only on the flesh side, but on the grain side and inside of the hide.

It would seem to me that your first step is to try to get rid of as much of that fat, at least the extraneous fat, that which is on the surface, or close to the surface, before you think of liming. And today with the detergents we have—sodium tetrasulfide etc., they could be introduced into your soak.

In our particular case, where we have water with thirty grains of hardness, we are not going to wash everything out without doing something about it. We have done considerable work along that line and believe that by starting at the soak and then continuing through the lime on that particular type of hide and by juggling the amount of sulfide or sulfhydrate that you use, you will remove a great deal more of the natural fat and consequently, remove some of the stresses and strains which are brought about by the uneven curing found in the same hides, due primarily to fat.

Most of you are familiar with the way hides are cured, either in the packinghouse, or some other place. The greater the amount of fat, for instance, the slower and harder it is to get the cure into them.

I want to toss that thought in here to start on that particular type of hide with the soak and then go on and modify your limes accordingly.

KAY: Did I understand that you use a detergent in the soak for that type of hide?

THORSTENSEN: Yes, but we have not made up our minds yet which is giving us the best result.

CHAIRMAN MORRIS: The upholstery leather group frequently deals with heavy types of hides, heavier than normal, perhaps. Have you something to add, Mr. Koeniger?

KOENIGER: We soak on the average 60 pound cowhides and about 70 pound steer hides. We seldom run into fine hair trouble on the hides we soak. I believe Mr. Swedenborg does work on steer hides. Maybe he has comments.

L. A. SWEDENBORG (The Raser Tanning Company): We run bulls and steers, 75 pound steers and 80 pound bulls, and do not get any of the grain crack you talk about. We still soak. I do not know whether we get any stresses, but we do not have any trouble.

KOENIGER: Fine hair is not a problem with us but it could be in the future because we are trying to push full-grained leather.

Gene Rosen from Ashtabula is in the group, he may have some comments on the beaming of heavy cattle hides.

J. ROSEN (Ashtabula Hide and Leather Company): I am a youngster in this country—just here two years, so I could not give you too many comparisons between the liming in the United States and the liming in Europe. I have been associated only with one company, the Ashtabula Hide and Leather, for almost two years now— but it does not seem to me there are too many differences in the liming procedure as far as the bull or steer leather is concerned, in the United States and in Europe.

I would say that we have more methods of liming in Europe than we do here. Most of the tanners do their liming in vats and the length of liming is four to five days.

In Europe many upholstery and even sole leather tanners are doing the liming of hides in drums, using higher temperatures in the liming. At Ashtabula the ratio between lime liquor and hide is three to one. In Europe I think tanners are more careful in soaking than here. They pay more attention to having the hides very well soaked. From my experience I could say that I have found that a good soaking helps with the unhairing problem.

I do not remember that we or other tanners have had problems with fine hair. Of course, in Europe most of the hair is burned off. It does not pay to save the hair, especially on the short haired cattle. If the liming is done in drums, as is mostly the case, larger amounts of sharpeners are used. Mostly people are using a combination of sodium sulfhydrate and sodium sulfide. I do not know anybody who is using entirely sodium sulfhydrate or sulfide.

Temperatures, I think, are slightly higher. Here in the States we are using a temperature of about 68 to 70 degrees, and in Europe even on upper leather, where we use two or three days liming, we are using from 75 to 80 degrees, along with a sharpener. It helps to get a wetter unhairing than the lower temperature. In order not to get too much hydrolysis of the collagen they are shortening their liming time.

I think, too, that we are using more older lime liquors, at least to start with, than is done here.

The people in Europe usually start with an older liquor, more mellow, and gradually come over to finish up with a fairly fresh liquor, especially on sole leather particularly. I do not remember people liming for five or six days. They use a sharp liming and use quite an amount of sodium sulfide to get a good piece of sole leather and a good yield.

On fine hair and to decrease unnecessary swelling or extreme swelling, they are using salt (if there is no lime present, of course) or calcium chloride in moderate amount.

As far as grease is concerned, I would say that on North American hides, in the time I have been working here I have encountered much more natural grease than on the hides we had in Europe. Of course we did not need to use any detergents in the soak over there, although some people have been doing it.

Sodium tetrasulfide works pretty well, not on account of the grease but by getting a good soaking action, especially on dry hides.

I do not know what else I could add. I would like to ask if anybody has ever tried to use a higher temperature in the liming, especially the first day? Has anybody ever gone up to higher than 70 or 72 degrees? Has Mr. Lotz done work on this?

LOTZ: At the present time we are using a little higher temperature than 70 or 72 degrees in our limes. It goes back to two problems. First of all, there is a scientific way of doing things and then there are ways of doing things that you are forced into. Most tanners are forced into processes because of the floor space, available equipment, and the time factor. You often do not do what you would like to do.

We had a problem in that we had to run tremendous productions and had to modify our soak procedures. We did not have enough beamhouse space and we went to a drum type of soaking, but in the drum type soaking we go to elevated temperatures of 90 degrees during part of the process, dropping them down at the end. We add sodium tetrasulfide and high amounts of salt. The salt seems to take out a good deal of the natural grease or throw it toward the surface in this particular process, and then when we get into the fleshing operations, we are able to pick off a good deal of the grease from the flesh side in the fleshing machines.

With that grease subtracted our sulfide limes are better able to get at the grease on the grain side in the limes. So mostly by accident we found that very little of our leather had anything resembling grease spots. Because of our high soaking temperatures we run our temperatures up on our limes a little bit and are sometimes liming at around 74 or 75 degrees. The beamhouse is built so close to the river, that in the pits we drop a couple of degrees during liming so that when we come out of the limes we are at 72 or 71 degrees. However, we are going in at much higher temperatures than 70 or 72 with our water.

ROSEN: In Europe, mostly in Germany, they have alcohols which they are using in the limes. This was meant partly to give more uniform liming. Of course not all of them are in stable alkaline conditions.

LOTZ: We imported a number of agents from Europe and ran experiments with them. We could not find significant differences with the addition of the wetting agents in the lime solutions.

KAY: Did you use that agent in the soaks or in the limes?

ROSEN: In the soaks, and it gave us more uniform liming. The packs were not so much exposed to the action of the chemicals and the sharpness of them as is usual with packs of the same hides without the addition of the agent.

The best calfskin tanners in Europe have been using arsenic in the lime

instead of sodium sulfide. I guess that is because you get much less plumping action with arsenic than with sodium sulfide or sodium sulfhydrate.

LOTZ: I would like to ask a question: my friend, Art Goetz, never agreed with this theory and he is a firm believer that you should never put anything like salt in your limes. Obviously we carry salt over from soaking into our limes and have had excellent results. I know the European experience has been very good with the addition of salt to lime liquors. Would you comment on that?

ROSEN: That is right. European tanners very often, especially the upper leather tanners, are using salt in the limes. Mostly I would say the calfskin tanners in Europe are using drums and not vats. Where they have two per cent sodium sulfide, they have up to five per cent of salt in the drum. They believe it has a better effect on hide substance.

I have used salt many times and I have never had any bad effect.

I was a little amazed in listening to the problem of cracking in sole leather. I never had this condition of spots or cracking. Whenever I had it, it was due to the fact that they were either overloaded with uncombined tan or not washed out too well, or loaded with Epson salts or sugar, or some other stuff. But I never remember any case of spots or cracking grain.

KAY: That problem has increased in recent years and you can see it right in the beamhouse.

ROSEN: It might be connected, too, with spots of grease not removed and from the fact that the liming action did not take place on those spots as well as it should have.

CHAIRMAN MORRIS: The response and interest has been very gratifying this morning and it indicates we are not going to have time this year to continue on through tannage. However, there seems to be much left to be said yet on the beamhouse operations. We have gotten the hides unhaired and we cannot leave them in that condition. So we will adjourn for lunch and return at 2 o'clock at which time we hope to get them out of the limes and correct some of the further troubles.

CHAIRMAN MORRIS: The meeting will come to order.

WILSON: Your panelists had lunch this afternoon and decided that we had left a couple of questions in the air on the subject of liming and hair removal.

Therefore, we decided that it probably would be a good idea to continue along these lines for a short period of time so that if anyone has remaining questions on the subject of liming and hair removal , we can take care of them now.

And we decided to limit this in time, not in subject. At a quarter of three your moderators intend to change the subject to deliming and bating, which we would like to have discussed simultaneously.

We pretty well covered the six viewpoints in liming and unhairing and yet there were some questions unanswered, particularly those of Chet Ross, who was on the subject of the additions of sharpeners on the second day. Do you want to carry that any further?

Ross: I don't think so, unless somebody else is interested in why we do it, or has an opinion why we should not do it from a scientific standpoint. I just tried to get a discussion started. It is a scientific fact that from a given amount of sodium sulfhydrate you get maximum unhairing by applying it to your skins immediately in the lime. So you wonder, why add it on the second day? Dr. Turley explained one reason you might do it. However, I think if we put all of the sulfhydrate in the first day it still would not be enough to damage the hair.

Mr. Meyers mentioned that they add it on the second day, on their three day lime. Is that added to help the fine hair?

Meyers: We have seen no difference between our two-day and three-day process as far as fine hair is concerned. That is something I should have brought out this morning. We have examined the skins very, very carefully at stations where we could really check the fine hair.

Chairman Morris: We have found that the time or location of adding the sharpening agent may make a difference and it relates somewhat to a recent article put out by Dr. Lollar, I believe, on the effect of immunization. If we added all of the sulfide first, for the first feed in the lime in order to get sufficient unhairing and eliminate fine hair, it would attack the hair and result in a poorer quality. But if a certain length of time later, after the addition of lime, the sulfide were added,, it could be controlled to a degree with the frequency of mechanical action so that we could fairly well get rid of fine hair without affecting the quality of the hair that we save. This is not to say that we never have any trouble with fine hair.

Martin: Many years ago Dr. McLaughlin said to me that the best time for the sharpening agents is in the first day, or the first addition. The way this was carried out was that at one time they had a four hour re-soak after green fleshing. In place of the four-hour re-soak, the skins were put in with a small amount of lime and the entire amount of the sharpening agent. That was done, according to him, to have the sharpening agent get to the bottom of the hair

follicle before plumping of the skin took place by the lime or any other agent present.

One time I saw a goatskin operation where they used a sharpening agent—quite a bit of soda ash with lime. On the first few packs everything went in at once and they expected to have a three-day unhairing process. At the end of three days, you could hardly touch the hair.

Taking that same process and putting the skins in with a sharpening agent and a very small amount of lime, giving it approximately four hours in that soak and then starting to add the balance of the lime and what soda ash they intended to use, at the end of three days they had a perfect unhairing action. That is just the difference that I have noticed.

As far as we are concerned, we do not add it all at once. We start with an old lime. When we start our fresh lime we add it over a period of three days. It is a very gradual addition. From what we have seen, we have a gradual plumping and in the other case, where the sharpening agent was added first, you started plumping immediately. In fact, one was very good and the other was very poor.

CHAIRMAN MORRIS: Apparently there is no absolute process that can be recommended in every case. This touches on the matter of the difficulty that Phil Waite reported on scudding, eliminating the fine hair from his stock and particularly those skins that were at the bottom of the pile. A further way out of this difficulty, so far, has been the use of hand beaming which we have heard before, at an extra cost.

MEYERS: Did I understand that someone this morning is using a rubber-bladed unhairing cylinder and used it to good advantage?

BERNARD: Yes.

MEYERS: We have tried different hardnesses of rubber rolls, double blades and single blades, on unhairing cylinders in different attempts to get a better and cleaner unhairing job, but yours is evidently a good hard rubber?

BERNARD: It is between a hard and soft. It is not entirely hard. The hardness would probably run around 50 to 60, I would say. I have never tested it, but you can make an impression with your finger in the blade.

The point there is, I believe, or the theory is, not to run the cylinder too fast to break the hair off, but rather to pull it out and not break it off and leave the stub in.

MEYERS: And the rubber causes a friction which helps to pull the shaft out of the follicle?

BERNARD: Yes.

MEYERS: Where do you get those cylinders?

BERNARD: I can give you that later I don't have it here now.

MEYERS: Thank you.

CHAIRMAN MORRIS: Another matter that was brought up this forenoon and not completed was the question with regard to drawn grain. That question was with relation to tanners who use a shorter process and a more highly concentrated unhairing solution. That, I suppose, would take care of the fine hair, but it would also pretty much take care of the hair itself, as far as resale value is concerned.

In this shorter and sharper process, the question was asked: what might cause the drawn grain in the bellies and is there any experience that would show that you could use a shorter process without necessarily bringing in the factor of drawn grain, particularly in the bellies. This may, in a sense, be divided perhaps into factors having to do with liming or with bating.

WILSON: Mr. Salamatov, I think you have ideas on that subject. You showed some interest in the meeting this morning.

SALAMATOV: Yes, I don't want to say that I have ideas, but I have interest, all right. There is no question that with increasing the concentration of the sharpeners, the draw along the bellies also increases. Therefore it is a parallel action or parallel result.

As far as hair is concerned, we are never very much concerned with the hair and it is partially destroyed (never completely); it is still saleable but would not make an A-1 grade.

Now, the thing about the draw is that it is seen both in the more concentrated process and in the less concentrated process and, if anything, from time to time, you will find more in the less concentrated rather than in the more concentrated process. So there are some things which I do not know how to account for and I would like to hear whether anybody has any comments to make on this.

WILSON: It was suggested this morning that the high concentrated process aggravates drawness. I have forgotten who made that comment.

CHAIRMAN MORRIS: I think Mr. Lammert brought that up this morning. He has just come into the meeting.

LAMMERT: The drawn grain I was referring to this morning is the drawn grain caused during the process of liming—an effect which we usually call

sulfide draw. Most of the grain draw we have is in heavy steers which are coming now in ever larger number to be made into side leather. This drawn grain can be minimized as a rule by balancing the proper portion of sulfide to sulfited grain in the skin. This does not show up so much in the shorter process as in the three- to four-day process. In New England we have a twenty-four-hour process.

I wonder if there is anyone here who has any experience with minimizing wrinkles during a short sulfide liming process.

BERNARD: I can corroborate what has been said on that same thing. Before I came here I had an opportunity to make a test on four different methods of liming green salted kip sides. There is one method known as a high sulfide; another method is a low sulfide and prolonged liming—enough to burn the hair. The other two methods were liming with different sharpness. So that when these skins with the four different methods were brought into the pickle (we get a habit of looking at the skins in the pickle because even in the lime they carry certain fleshing machine marks and so when they come into the pickle, naturally we examine these skins) there was a distinct difference in the drawn lines, not only of the bellies, but continuing even up into the head portions of the skins, according to the various methods used.

It is a peculiar fact that when those skins were tanned, they got upstairs where they were dried and we did not see as much difference as we did in the pickle. But from the conclusions we drew, we felt that the lower sulfide seemed to be the smoother of the four—even smoother than the lime sharpened with certain sharpeners. I did not mention the names, but they are sharpeners used a good deal. The skins seemed to be smoother in the pickle. From there on we did not notice so much difference in the leather.

RIESE: Although most present here already know it, I think it should be noted that most tanners who unhair will split in the blue while those who burn the hair by sulfiding, as is done to a great extend in the New England area, will split their stock in the lime, a procedure which results in a smoother, better let out, tighter breaking side.

WILSON: The discussion so far seems to indicate that drawness then, is a function of alkalinity. We have been talking about the sulfhydrate-sulfide ratio. To a chemist this means the more sulfide, the more alkalinity. The sulfide ion, not knowing whether it came from a barrel of sulfhydrate or a barrel of sulfide, should be one and the same and it is a matter of alkalinity then that causes drawness.

I wish the conclusion were as simple as that. I hope it is as simple as that. If it is, possibly some tanners can go home and eliminate their drawness. I doubt it, though.

LAMMERT: I do not believe the conclusion is so simple because these wrinkles are either, as Mr. Bernard said already, on kips or they are on steer hides. I would not be surprised if one of the other gentlemen would bring up the statement that most of these wrinkles are caused by the soaking—that the soaking is too long, the belly parts have gotten too flabby and the sulfide will attack these belly parts so fast that they will shrink. It is a chain-like design, strain all over. I do not have to explain it because everyone of us has seen it, I am sure.

SALAMATOV: The observation I wanted to make is this: that although in painting methods you have the addition of sodium hydroxide to the paint and therefore increase your alkalinity still further, you will find less draw than you will find in the regular procedures which use smaller alkalinity. And I want to reemphasize that it does not seem to be connected with the amount of sodium ions in the solution. Because in our way of liming, one method has considerably more of the sodium ions than the other. And yet the draw will be about equal. And sometimes the lower concentration produces more of the draw.

KAY: Mr. Salamatov, Mr. Wilson was speaking of alkalinity. That is OH and not Na. Your Na ion depresses swelling and the OH increases the swelling.

SALAMATOV: Once you put sulfide in the solution you get NaOH whether you want it or not.

WILSON: My point is that in solution the sulfide does not know whether it came out of a sulfhydrate barrel or a sulfide barrel.

SALAMATOV: But with a mixture of the two solutions you have ionized them and have a number of Na ions. When you get a number twice as big in one case as in the other and still have the draw, I do not think then that the conclusion could be drawn that it is due to alkalinity. I know that definitely from observation of quite a number of packs.

WILSON: Your experience would bear that out, yes.

KAY: Does salt have an effect?

SALAMATOV: The presence of salt will tend to minimize. I cannot make it more definite but it will tend to minimize the draw.

KAY: Did you actually determine pH or the pOH of those solutions?

SALAMATOV: I would not say we determined it enough. We only have a glass electrode and that does not show very much difference after eleven.

KAY: You can approximate it by determining the soluble calcium.

SALAMATOV: We did not do that. Because in my opinion, that has no bearing on it. We have an excess of lime and the solubility of the calcium would be limited.

KAY: The solubility of calcium is such that it has a measurable solubility product. So your OH might be very different in the two solutions.

SALAMATOV: We have not done that.

WILSON: Dr. Stubbings might take issue with Arthur Kay on the oversimplification of the solubility product. Incidentally, we have not talked about calcium solubility in its role of unhairing here.

R. STUBBINGS (Lehigh University): I think for this meeting we do not want to get involved in arguments on theoretical chemistry, but I would be very happy at some other time to discuss with Mr. Kay the question of solubility product of calcium hydroxide.

One thing I would like to know, though: we made a lot of laboratory tests of swelling and a lot of very careful analyses of the solutions that produced that swelling and we found that over a small range of concentration of hydroxyl ion, that swelling was almost a linear function of the OH concentration.

Now, from what Mr. Salamatov says, he does not apparently observe that in the two liming systems he is discussing. I wonder if he would tell us a little bit more about the particular liming systems, as regards the concentration of sulfide or the ratio of sulfide to sulfhydrate used so that we might better determine whether there is a change in alkalinity.

SALAMATOV: One of the systems is the regular Hooker procedure, which has a ratio of sulfide to sulfhydrate of one to three. In the other system the sulfhydrate is considerably stronger than the sulfide and I would say that the total amount of sodium coming from the two of them will be at least twice as great.

STUBBINGS: Well then, as I understand it, you have in one case increased the sulfhydrate but kept the sulfide content in both cases about the same.

SALAMATOV: Approximately, yes.

STUBBINGS: In that case then, at least in laboratory systems of that type that we have studied, there would be no real change in alkalinity. The alkalinity of both systems would be almost the same. So I do not think your experience with the two lime baths showing the same drawness refutes the ideas that drawness is coming from alkalinity because the swelling in the both systems would be very much the same.

KAY: And the drawness just about the same?

STUBBINGS: Yes.

BERNARD: I would like to suggest that where conditions are so close, visible swelling would be very hard to detect. However, you take a twenty barkometer sulfide solution and by contrast take a ten barkometer, and treat your skin first with a twenty barkometer—one set of skins—and another with a ten you would then have a marked difference in the amount used. And where the difference is so great, there is a distinct visible difference in the swelling and also in the drawn effect. Whereas, if you take two solutions that might have a comparative strength of eighteen and twenty, the difference would be so slight that it would be almost invisible. But I have detected in solutions of twenty and ten a marked difference in the swelling and also in the drawn effect. I have seen that visually.

CHAIRMAN MORRIS: As a practical observation from Mr. Lammert's statement that the twenty-four-hour process of high concentrated solution or higher concentration of sharpness shows more drawing than the forty-eight-hour process—it would seem that after the twenty-four-hour process you would find more observable drawing on the hide which, if those hides remain in the same solution for another twenty-four hours, disappears to a considerable extent due to the more complete penetration of the sharpness through the hide and therefore more uniform degree of swelling of the structure. Would you agree to that, Adam?

LAMMERT: Yes, that would depend on the locality. In other cases we have minimized this draw by just the liquor and reliming without washing. In other words, if we wash between the lime sulfide and the second day—if we wash a longer time, then we certainly will get a wrinkled condition which will show up much more. It certainly will relax the second day. In regard to Mr. Riese's statement that in New England most of the tanneries are using the lime split process, that is not so true today.

CHAIRMAN MORRIS: Is there any other tanner here who uses a sharp liming process, who would care to make any remark?

WILSON: It has been said in the past that deliming and bating in practice, simultaneously, as is usually the case, have something to do with drawness. I have heard that said. I do not know anything about the subject. Side leather tanners are definitely concerned with drawness. I do not think it has ever been demonstrated at the Rueping Company that deliming and bating influence drawness. But before we get to the specific subject of drawness, relative to deliming and bating, let us take the case of sheepskin, in which it supposedly, as I understand it, is completely removed. Is that right, Charlie?

C. T. CARES (John Flynn & Son): Supposedly. In New Zealand, where most of our skins come from today, some bate the skins and some do not. We have trouble, and as some of the sheepskin men can tell you, this spring particularly they are having a terrific problem with stain. It has happened all around our section and for that matter, some of the boys brought some skins with them and they would appreciate it if some of you heavy leather men would swap ideas about the subject.

We do not have any control over most of the skins that we use. I think Mr. Bernard is one of the few sheepskin men here who has any control over his work. So we have to take pretty much what comes to us. We have trouble with lime, not too often, but occasionally. Technically the skins are supposed to delime completely. When sheepskin tanners bate they do it pretty much the same as on heavy leather. There is not too much difference. I would like to see them more uniform. I would like to see everybody bating. There is no question that if we could have a well bated sheepskin and well delimed, our problems would be a lot simpler than they are. Maybe one of the sheepskin men would like to talk a little more on this.

F. L. FREEMAN (Naumkeag Tanning Co.): I believe I was plagued more than anybody else in the industry, perhaps, so far as these stains were concerned. We did not at first realize that it was general. We thought possibly it was factory damage, but we were still making leather the same as we have been for the last seven or eight years, with no radical changes. And when it finally did develop at a Tanner's Club meeting in Salem, that others had this trouble, we naturally sent out the SOS. Now the Salem Oil and Grease did take quite a few of our samples and analyzed them, and they tell me that in their opinion this condition was caused by a lime soap. The solution to our problem would be to get something to dissolve the lime soap and clear it out. It was suggested that we use muriatic acid but it does not answer the question.

The second idea was that possibly it was a chrome soap and sulfuric acid was suggested, but it still did not work. So we really have a bear by the tail and do not know what to do with it.

Assuming that it is a lime soap, if anybody could tell me how to dissolve that lime soap, we would try it tomorrow morning.

CARES: I wonder if calf or side men here might have run into this problem and might have traced it back to bating or deliming. I think the suede calf or kid men would notice this. It shows up on the suede side. I have never seen it on the grain side of the leather.

It is a definite stain that is hard to explain. You can look at the sample after the meeting, if you wish. It is a blotchy stain, and for instance, on a navy blue it will color into a much lighter shade of navy, and on a rust shade it will color into a darker shade of rust.

We have very little control and know little about beaming, and our fellows have hoped some of the calf or kid men would have bumped into the same thing.

D. F. HOLLOWAY (R and M Industrial Laboratories): I wonder if you tried anything like Calgon because it would probably give you some success on degreasing.

CARES: I have tried it and it had no effect. We tried sulfamic acid because we understood it would dissolve lime, but it did not.

There is something unusual about our skins this year. Maybe some of you are familiar with the fact that we put the skins between plates under pressure to remove the grease. But we are getting a stain from pressing alone, between the steel plates. But that is a different type of stain, although it has some connection because we have never had trouble with stain from presses before.

LAMMERT: If it is a lime soap you would expect the solvent degreasing method would take care of it or minimize it at least.

CARES: We are not sure it is a lime problem.

LAMMERT: I believe we will have to see this effect in order to know what we are talking about.

WILSON: I think theoretically an insoluble metallic soap would remain insoluble regardless of the conditions in water. If there were any action through a chelating agent it would be a physical thing and would never actually dissolve the material. I think the only thing that will dissolve a metallic soap is acid, isn't it?

HOLLOWAY: I think it will chelate the thing and solubilize it. You can disperse lime soaps in the bathtub or any place else.

CARES: It is generally a condition on New Zealand pickled skins. I have not seen this on domestic skins.

MARTIN: Have you contacted anyone in New Zealand on this?

CARES: We have very indirect contact with the packers in New Zealand. We have passed it along but have not been able to get anything out of them as yet.

MARTIN: We have had problems with New Zealand calfskins. We import a great number every year and over the past four or five years their quality has fallen off. To try to get an answer out of New Zealand is almost impossible.

The only way we obtained information was when skins started coming in heated and we filed a damage claim. And the minute you start pressing them for a damage claim, it reflects back to New Zealand and somebody starts looking around and thinking about it a little more.

But I cannot understand what has happened to New Zealand calfskins. We have had New Zealand calfskins and they will come in averaging four and one-quarter pounds. We have had skins that will be four square feet in area and some of these skins you could not find clean grain the size of a silver dollar because they were so scratched. Something is taking place in New Zealand which we cannot understand and it may be affecting your sheepskins in the same manner it is affecting us. I think it goes right back to New Zealand.

CARES: That is another theory, that it is something that goes right back to the raising of the skins. It has been a funny set-up in New Zealand for a few years anyway. The prices are high and they rush the skins into market a lot sooner than normal and it may have some effect. It seems to me the longer the skins stay in the pickle, the less prevalence there is of the stain. It seems to us that we are getting away from it to a certain extent and we do not know why.

BATTLES: This is a problem I had not heard of before. You say this occurs on the flesh side of the skin only?

CARES: Yes.

BERNARD: I would like to inquire if you repickled these skins in treating them?

CARES: We repickled with sulfamic, hydrochloric and sulphuric acid.

BERNARD: Have you tried depickling?

CARES: We have thought of that and are trying it but we have not had results yet one way or the other.

FREEMAN: In Gloversville they drew the pickle out and repickled, but it did not help at all. I do know this: that the numbers of dozens involved goes way into the thousands. If Lawrence does not have the condition they may not know what to look for. In some cases it is obvious and in others you have to take the nap and look in a certain direction which a customer will do, and if you tilt it at a certain angle, it comes right up and hits you. We tried everything but cooking the skins, to try and get rid of the thing and we just cannot do it.

BATTLES: It may be a "chicken wire effect."

CARES: That is a different thing that I am referring to. The chicken wire effect is a thing in itself and can be corrected mechanically.

CHAIRMAN MORRIS: Because of the shortness of time remaining, we ought to go on to the bating operation, possibly following along with the washing of the skins before bating and try to get as far today on that as we can.

KOENIGER: We probably bate a lot differently than most of you. In our beamhouse we have a crane set-up so that our hides are hung in suspension in bating pools. The hides will go into the water for five or ten minutes, just a quick dip, and then directly into the bating pool. We use approximately three-quarters of one per cent bate on the hides and they stay in these pools approximately eighteen hours. During this time we try to keep the temperature between 68 and 70 degrees.

Are there any comments from anybody in the upholstery end on bating?

WILSON: Are your objectives the same in upholstery leather as in side or calf leather?

KOENIGER: I do not know. I do not know enough about side and calf to say. We leave quite a bit of lime in the hides going into our rocker yard.

WILSON: Now we will find side and calf leather tanners are going to have the biggest sources of controversy on this subject, all the way from complete deliming to hardly any deliming. How does Trostel do it and how do you build desirable leather qualities from the deliming and bating process?

LOTZ: In the beamhouse we are mainly interested in plumping up the skins as much as possible. Therefore we are not interested in doing a complete deliming job by equilibrium pickling. Actually, when we talk of bating in our tannery, it is part of a continuous operation on our side leather, in that the bating, pickling and tanning are just one single continuous process, the whole thing taking about six and one half hours.

We feel that bating is significant on side leather, and tremendously significant particularly on the lighter skins. We run hides anywhere from 25 pounds to 100 pounds. We used to buy a single enzyme blend for our bating operation. We since have changed our thinking on the thing and are buying our enzyme and our delimer separately and for the different weight classifications, actually setting up our own formulation of bate delimer combinations.

For example, on heavy hides, you are interested primarily in your deliming and not so interested in the bating because most of these hides are going into heavily corrected leather. On light hides we are tremendously interested in

the enzyme action because we want to clear up the grain for full-grain leathers.

In our tannery we are a firm believer that the only thing we ought to use for bating is pancreatic enzymes. We have had poor experience with the other type of enzymes. We have seen considerable differences time and time again when we used well prepared pancreatic enzymes in our bating operations.

Would you care to comment on that, Dr. Pfannmuller?

J. PFANNMULLER (Wallerstein Co.): The only comment I have is that your observation is perfectly right. In the discussion of proteolytic enzymes you enter into a very difficult field. From an enzymatic standpoint, the so called "pancreatic enzymes" do not consist of a single enzyme but they are composed of quite a complex mixture of different proteolytic enzymes. Each of these enzymes is able to perform a specific action.

The proteolytic enzymes contained in pancreatic bates are different from the normally used bacterial proteases in bating preparations. Bating preparations from pancreas might apparently contain quite a few more different proteolytic enzymes than bating preparations from bacterial enzymes. All the enzymes contained in pancreatic bates can be active and influence the bating action. Our personal experience, based on many years of observation, has led us to the conclusion that neither bates containing mold enzymes exclusively nor bates containing bacterial enzymes from anaerobic bacteria belonging to the species Subtilis, as normally used in bacterial bating preparations, exhibits the same bating action as can be obtained with pancreatic bating preparations.

Of course, there might be other proteolytic enzymes from other biological sources which are not yet thoroughly investigated and which might improve the bating action.

You are right to state that generally in bating, you want to influence the appearance of the grain. Entirely different methods, therefore, are carried out in bating skins for side leather than for kidskin. You also bate suede skins. In bating suede skin you expect an entirely different action performed by the bate than in bating grain leather.

A little while ago you were discussing some trouble occurring with pickled New Zealand skins. A possible explanation of this trouble might be as follows:

If you have a limed skin where the fat has been changed to a lime soap and you subject this lime soap in the skin to the action of a strong acid, a decomposition of the lime soap occurs and you get free fatty acid on the one hand and the calcium salt of the acid. The free fatty acid can tan your skin. This might happen locally under the influence of high temperature. So you would get skins that contained spots consisting of "fat tanned leather." Any goatskin tanner probably can tell you of his observation that some goatskins contain tanned spots due to the action of the free fatty acid on the skin. This can happen where goatskins are subjected to higher temperature during drying or if by naturally occurring bacterial proteases, free fatty acid is formed which, under the local heat generated during the bacterial fermentation, combined with

the skin. To my knowledge, no goatskin tanner ever was able to remove these spots. It is simply a skin tanned in spots and in order to remove the tanned spots you would have to destroy the skin. Perhaps a goatskin tanner can tell you more about the practical experience as to how these spots behave in bating.

WILSON: Dr. Henrich, do you have anything to say on this subject?

HENRICH (Surpass Leather Co.): I can assure that what Dr. Pfannmuller said is correct when it comes to these fatty spots. There is a tanned portion there. We get these, on certain types of skins. You cannot remove them. We have tried a good many ways, and they are impossible to remove, unless you want to digest your skin completely and then you do not have anything left.

Our experience in bating has been that we do prefer pancreatic enzymes. We have tried others—bacterial enzymes, for instance. But even though on analytical laboratory tests they show approximately the same activity, in order to get approximately the same bating action on your skin and the same type of finished leather, we have to use a much higher proportion and we still do not like the grain as well as we do with the pancreatic enzyme.

When it comes to bating goatskins, we bate overnight. I know that is not usual for calfskin and side leather. Up to not too long ago, we bated with a so-called two-bath process—I am referring to stock going into glazed kid and not suede—in which the skins were first put into an old bate liquor in which a certain amount of fresh enzyme was added and you got the beginning of your bating action and also the beginning of your deliming action.

Then those skins were pulled out of the paddle and the fresh liquor made up—fresh except for a small portion of old liquor left in the reel. A fresh amount of enzyme was added, the stock allowed to paddle for a time, and then left to lay in the liquor overnight.

However, that type of bating is very, very difficult to control. You cannot put that down on a definite percentage basis. You must have a very, very good man in your bating department. You have to depend entirely on him.

At the present time we have given up the two-bath system and we now use the one-bath system entirely with the pancreatic type of enzyme, and we are getting much better results. It is much more easily conrolled.

I might say in preparation of the skins for bating, that after the skins are unhaired and fleshed, we put them into the paddle in which we are going to bate and do our washing right in that paddle. We wash to a definite point. The length of wash varies a little bit. Actually, in order to get the skins washed to the same general point, we have set up a rough titration system, if you want to call it that. It is done with a graduate. We just check the water in the paddle periodically until we reach a certain point. We use a standard acid solution which has an indicator in it, and the foreman takes a certain number of cc's of

the wash liquor and then adds this acid solution to it, until he gets a change in color. We have set a certain reading as the proper point at which to stop washing. By that time the stock is brought up to temperature. Our deliming material and bate are added, and the paddle is run for a certain length of time. Stock is left there overnight.

C. A. LAUDER (Wickett and Craig): I would like to say something about fungicidal enzymes as related to pancreatic enzymes. I spent two to three years in the beamhouse doing actual bating and I did a lot of careful control work while I was there. In no case did I find that the fungicidal enzyme gave the bating feel that we required in side leathers, either for heavy leather work or for the lighter type of hide. I also found that there was definitely a difference in the grain. The grain was not as smooth, and it seemed to me that there was a greater fall toward the bellies in the fungicidal enzyme, no matter how hard I tried to control it.

LAMMERT: I would just like to go back a minute to the bating process Mr. Koeniger explained. Did I understand, Mr. Koeniger, that you bated at a temperature of 76 degrees Fahrenheit?

KOENIGER: I said 68 or 70 degrees.

ROSEN: I do not think personally, that you are getting bating action at 68 or 70 degrees because the elements are not activated at that temperature. What Mr. Koeniger is really getting is a deliming and that is due to the ammonium sulfate, or ammonium chloride.

I would like to take this opportunity here to draw again a parallel between Europe and this country on upholstery leather. In this country the heavy leather is lime bated. In Europe they do the bating and then the deliming. Over here they delime a hundred per cent and some others delime only to a certain degree and then add the bating material.

The temperature of the bating is around, I guess, over 90 degrees Fahrenheit —about 38 degrees Centigrade. The pH was usually held at between 7.5 and 8.5, in this range, and is carried on until the hides are completely lime free and completely bated. And no test will determine whether the bating action is complete or how far it has gone. You have to use your feel and your judgment. And by trying to press air through the hide, it gives you a certain indication, too, whether the bating action was long enough or not.

I think this difference mostly is responsible for a much nicer feel and a softer piece of leather for the upholstery leather here in the States. Another point might be that in Europe most of the upholstery leathers are drymilled much longer than in this country. But as far as the bating process is concerned it is entirely different in this country.

In our Ashtabula plant we have a different bating procedure than Mr. Koeniger described. We are bating at a temperature between 85 and 90 degrees and

using much more enzyme—one and one-half per cent, at least. So we are getting a bating action. But the one Mr. Koeniger referred to, I do not believe has any action taking place.

W. H. Good (Lackawanna Leather Company): Most people bate at a higher temperature, I believe, for a shorter period of time.

Chairman Morris: We seem to have found a variety of applications for the various types of leather. I would judge Dr. Pfannmuller gave the impression that the pancreatic enzyme would be more surface acting and that the use of molds and bacterial enzymes might give more penetrative action. Is that right?

Pfannmuller: Your impression is right. You can get an enzymatic action at the low temperature Mr. Koeniger has mentioned but the action is delayed. Usually, enzymatic actions follow roughly the Van't Hoff generalization that with every 10°C. rise in temperature the enzymatic action proceeds about twice as fast within the same time interval. If you delime and bate simultaneously, you can easily observe the action of the proteolytic enzyme. Delime a piece of skin with ammonium salts alone without using any enzyme and compare it with a skin using the same amount of ammonium salt and enzyme. You will observe that the deliming action progresses more rapidly in the case where enzyme is used with the deliming agent. A possible explanation of this fact might be as follows:

During the alkaline beamhouse process certain protein constituents have been cleaved. These cleavage products are not yet water soluble and may resemble gelatin. Due to the attack by proteolytic enzymes, these cleavage products are solubilized and removed from the pelt and thus, the deliming agent is able to penetrate more readily. At the same time, however, you also get some specific bating action.

In Mr. Koeniger's bating procedure he probably intends to get only a little action on the grain of the skins. You will not influence the grain structure radically but you achieve some bating action on the grain anyhow.

As to the formerly mentioned difference in the bating action of pancreatic bates versus mold or bacterial bates, it might be well also to point out that you try to achieve various results in bating skins. On the one hand, skins for grain leather are bated and on the other hand, also skins for buck or suede are bated. The latter are finished on the flesh side. Certainly, you do not care about the appearance of the grain on buck or suede leather. In bating skins for buck or suede leather you want a skin that can be thoroughly and rapidly penetrated by the tanning agent. Therefore, you want a thorough removal of broken down protein products which, in later phases of leather manufacture could cause a glueing together of the fibers. Our observation is that in bating skins for leathers finished on the flesh side, bacterial or mold bates might be

superior to pancreatic bates. For skins finished on the grain side, pancreatic bates are superior to mold or bacterial bates.

LAMMERT: Gentlemen, I believe that the explanation of Dr. Pfannmuller has answered my question of the proteolytic action of an enzyme at a low temperature.

LOTZ: In side leather one of our problems in the last few years has been that we, in the side leather industry, have been sold on acid washing prior to bating. It was a firm belief of one of the supplier companies that we had to counteract what they thought was lime blast from our beamhouse process. So the business of acid washing prior to bating was sold to us with drum processes.

Subsequent investigation has shown that this is probably one of our most dangerous processes in that the acid washing gives us a fairly low pH, and if you add any of the bate material at the low pH you are probably killing your enzymes.

As time went on we learned to counteract the low pH by coming in with something like a small amount of alkali and kicking the pH back up. But even so it is quite dangerous because you have only short periods of time involved in some of our practices, and sometimes the pH is not consistent through the mill.

When you acid wash for a period of five minutes, if you take samples in various parts of your mill you will find that the pH might be something like the 1.8 in one spot, 2.5 in another spot, and 3.8 in still a third spot within the same mill, after five minutes. If you decide to kick that pH back up with something like lime, or even by putting in your ammonium salt prior to the addition of your enzyme, it takes a considerable period of time to get the whole mill back up to a pH of, let us say, seven or better, at which pH your enzymes really become effective.

If you run for a period of five, six or eight minutes at a pH of between two to three and one-half, with the enzyme in the drum I think you do serious damage to your enzyme and you therefore decrease your ability to bate your skins properly.

Have you had any experience with acid washing prior to bating?

TURLEY: I am sorry I was not able to be here before, but I am interested in Bob Lotz' remarks on this acid washing. I want to say right now that I have never been convinced myself that it is always necessary. In some parts of the country, particularly New England, it does not seem to be necessary to do that. But I was rather disturbed, Bob, at what you say because the low pH will injure the enzyme. In principle the way acid wash was worked out originally, was to take the limed hides after they had been washed and if, after washing, the hides become blasted, then enough strong acid was added to remove it. That has to

be worked out in such a way that the pH is lowered to three. It does not have to go much below that, and it should only remain there for three or four minutes when it quickly comes up again—the pH. Then the bate enzyme is added. It should never be the other way around so that you have a varying time of contact with the enzyme because low pH inactivates the enzyme.

I am aware that in the process where it was done in drums there might have been some difficulty. However, I think with further study it could have been worked out.

I believe it is better to avoid getting lime blast, and then you do not have to worry about it. Get your pH in a range where the enzyme will be functioning and go right ahead. I think it is a bit dangerous to do the other thing.

LOTZ: Our experience, Doctor, is that with as little as a quarter of a per cent of sulfuric acid the pH at the gudgeon in a standard mill will go down as low as 1.8 or 2. Also, (and I am talking about 18 RPM drums)— if you do not artificially kick the pH back up, it might take you for as long as fifteen, sixteen or eighteen minutes to get the pH back up to at least seven and one-half.

TURLEY: That is surprising to me because that has not been our experience, certainly in paddle bating. I am surprised that such a small quantity of acid would do this. The usual recommendations were a half per cent of sulfuric acid.

I am surprised that you had pH 1.8. Again that ties into the washing.

LOTZ: Usually the diluted acid feeds are made through the gudgeon—and it takes quite a while for the acid to disperse through the mill.

TURLEY: Is the acid added in a concentrated condition?

LOTZ: No. The acid if fairly well diluted and the temperature of the acid mixture is below 90 degrees because we particularly do not want burned leather at that spot.

TURLEY: It is surprising to find this in the drum and one wonders if some of the mechanical features of the drum are playing a part there. Whether it is acid or anything else, it should dissipate faster than that.

WILSON: We can substantiate Mr. Lotz' ideas at Reuping where we made similar measurements and we find exactly his results. We have critically questioned ourselves on the desirability of doing any acid washing at all. This is a mechanical feature, but it so happens that the blast would not be a problem even if we did not acid wash.

TURLEY: I would like to answer that. If you do not feel you are getting any lime blast, then do not do any acid washing.

LOTZ: If you are getting lime blasts the thing to do is to acid wash, but you must do it intelligently and also to regulate the situation within your drum over the twenty-minute or so period after the addition of the acid and prior to when you are bating. You are an expert on enzymes. I would like to know what you think happens to the enzymes at a pH of three or three and one-half. I do not know, frankly.

TURLEY: If you look it up in the literature you will see that the enzymes are inactivated—pancreatic enzymes are inactivated more rapidly than some of the others. But it is just a function of time and temperature. Take the case of pancreatic enzymes—if you leave them substantially below pH six for any length of time, you just inactivate them and you cannot get them back again. If you get down to pH 1 to 2, they go off very fast. The enzyme is just gone.

With the fungus enzyme and the bacterial enzyme there are differences in the points to which you can go.

Now, I would suggest as a thought, that you use a certain amount of less strong acid to hold the pH to a higher level—pH 2-2.5 and remove the lime blast if you really feel it is necessary to remove the blast.

PFANNMULLER: We have heard a lot about lime blasts. I think it would be very interesting to know the source of your lime blasts. Lime blasts consist of a deposit of calcium carbonate inside the grain, just underneath the upper surface of the grain. Therefore, it is unlikely that you can get this calcium carbonate deposit in the interior of the grain from the action of carbon dioxide contained in the air. Any calcium carbonate deposit formed outside of the grain cannot be harmful. Consequently, as long as the skins are protected with lime liquor they can be exposed a certain length of time to air containing carbon dioxide without getting lime blasts. Lime blasts are formed, however, if the water used in the tannery contains a large amount of calcium bicarbonate, that is, if the water has a high degree of temporary hardness. Soluble calcium bicarbonate reacts with lime, forming insoluble calcium carbonate. If this reaction occurs inside the grain, calcium carbonate is formed right there and you would expect to get lime blasts. The formation of the lime blast, therefore, occurs by washing the skins, after liming, with water of a high degree of temporary hardness. It is a very radical procedure to try to remove this calcium carbonate deposit inside the grain with an acid wash.

What really should be done is to avoid lime blasts and then the acid wash is not necessary. This can be done by conditioning the water so that the calcium bicarbonate is destroyed before coming in contact with alkaline skins, for example, simply by neutralizing the calcium bicarbonate in the water with lime before using it for washing limed skin.

Dr. Turley pointed out that there are certain dangers connected with the acid wash, especially as to possible destruction of the enzyme. Personally, I think the possible destruction of the enzyme is not the greatest danger of an

acid wash. It is well known that if you put the skins in strong acid without the presence of salts, they swell up. Therefore, as soon as the lime is largely removed from the grain of the skin, the grain is largely neutralized, readily combining with the acid, and becoming swollen. This action occurs very fast and long before the lime inside the skin is acted upon by the strong acid. You can observe this phenomenon very easily.

Put a fully limed skin in a dilute solution of a strong acid. Leave it there for only a few minutes, remove it from the acid solution, wash it with water and observe a vertical cut. Using a suitable indicator, you will find that the pH of your grain is strongly acetic while the pH inside the skin is still strongly alkaline. This shows that the grain is acid swollen, while the inside of the skin is still in an alkaline swollen state. Treating limed skins with a dilute strong acid is not so simple a process as the neutralizing of lime contained in water, as two reactions occur simultaneously.

If your skins, by an acid wash, have an acid swollen grain, the trouble not only will show up during the bating process but the grain has been damaged or distorted in such a way that the fault can never be corrected in all subsequent tanning processes.

In order to dissolve the calcium carbonate which has formed underneath the grain, you have to have a minimum pH of 3. This pH, even if maintained for a relatively short time, is much too low to avoid damaging the grain due to the swelling caused by the action of the collagen fibers with strong acid. If I were a tanner, I should avoid lime blasts. As mentioned before, this can be done easily by properly conditioning of the water, removing excessive temporary hardness.

HOLLOWAY: There are people who use lactic, formic and acetic acid for this type of thing and I do not think you experience the same difficulty with pH because it immediately goes up to the alkaline side. Do these acids effectively dissolve calcium salts, or are people fooling themselves about it?

TURLEY: No. I think in the ideal case the acids are dissolving calcium carbonate which is on top of the grain. Lime blast you can feel. There is no argument about that—when you really have it.

I will digress for a moment. It has been my feeling and experience also that if you have a little bit of lime blast, don't worry about it, but if you really have it, and it survives through the bating operation so that instead of having skins silky and smooth, they are still rough, then while it is still warm you had bettter do something about it.

The calcium carbonate as such, I know from experiments we had to do a long time ago, will dissolve at about pH three. I do not think it matters much what acid is used. But the carbonate is dissolved and I suppose goes in to the liquor and is taken off the surface. Any lime in the center of the skin begins to leach out.

So, to answer your question, I think lime blast is taken off, but I do feel that unless the lime blast is so bad that in spite of using your regular bating procedure the skins feel lime-blasted, out of the bate, then you should do something about it.

You will find cases where there is a slight amount of lime blast which disappears in the bate and in that case you will have a solubilizing effect from ammonium salts. That is the sort of experience we have arrived at, today. Do not do anything about lime blast, unless you have to.

BERNARD: I have a suggestion to make. I would like to comment and agree with all the statements previously made, including Dr. Pfannmuller's. I look back forty years to when we used a bate called a slime bate—I do not know whether anybody here has ever heard of a slime bate. It is essentially an acid bate made up of sulfuric acid and borax. The operation is peformed in a paddle—not in a drum, because in a drum you are going to get more uneveness and spots that are going to be delimed more, I believe, than in a paddle.

This operation was performed in a paddle as a pre-bate, or pre-drench and the treatment was carried to the extent that the center of the skin showed the desired amount of pink with a phenolpthaline test. In other words, we would go a third in from the flesh and the grain and leave the pink strip another third, or the pink strip could be controlled to represent half of the section of the skin, the thought being that the borax had a slippery action counteracting any carbonates. (The chemical end I won't profess to know much about.) But the thought was that it was a slippery condition of the grain and prevented a harshness and a carbonate or a lime blast condition. That was the theory of it.

From there, we bated with oropon. That was about the start of oropon, I believe. And we also used bran drenches on top of that. And the amount of bate was controlled through the preliminary bate which I assume is similar to the acid bate, or acid wash to which you refer, Mr. Lotz.

If those suggestions will help you any, borax in addition to the acid, with operation in a paddle, in place of a drum it might make some difference.

LAUDER: I would just like to suggest that if you have to acid wash at all, that you acid wash in a paddle and not in a drum. The paddle comes around and the liquor pulls the sides out almost to their full length, while in the drum they are falling over on top of each other and you do not get the same eveness throughout. It takes you longer for your pH to come up. In the paddle it will come up in at least three minutes to where you want it, if it is controlled carefully. Therefore, if you have the idea of acid washing at all to remove lime blasts, I would suggest you use a paddle.

HOLLOWAY: I just want to ask Mr. Lotz if he did not think if he shifted to an organic acid he would get away from those difficulties?

LOTZ: As we are doing it now, we are running the stock a little longer after the acid feed to take the pH in the acid wash and bring it to a form equilibrium in the drum. We were using much too short a period of time in the acid wash. We are now acid washing longer and kicking our pH up to 6.0 with a small amount of lime. After running for a few minutes we add the ammonium salt without the enzyme. We run for a few minutes in the ammonium sulfate before we go on with the enzyme. Therefore, we know that the enzyme is fully protected and the pH of the system, when the enzyme goes in, is above six and definitely in the range of around seven.

So, from the moment the enzyme goes in we are bating. Before, we were running the so-called sixty-minute bates but only getting forty-five minutes, with part of the enzyme inactivated. Now when we run a sixty-minute bate we know that sixty minutes is full bating time and action.

WILSON: Mr. Bernard's remarks included an important question which is probably worth discussion now. How much lime do you want to take out?

In calfskin, how much lime is it desirable to remove?

MARTIN: It depends on the tanner and what his process is like. As far as we are concerned there is no acid wash. We do not have to bother with that. We have never had trouble with it. We will go right into our deliming agent and bating and when it comes out of there, we will pickle.

You know there are calf tanners that want a complete and absolute no-show of lime with phenolpthaline. We do not feel that way. It depends on the kind of leather you are making, the way you bate and the way you lime. I do not think any of the calf tanners here would be bating the same as we do for the reason that we have an entirely different liming process than they do. There would be similarity in that we use ammonium salt and a pancreatic enzyme. Outside of that I think you would find as much difference between the way we bate and the way any goatskin tanner, or anybody else would. It is a matter of opinion and how you want it. We do not take the lime entirely out.

Are there any comments from other calf tanners on how they do it, or what they think about it?

IVANY: Commenting on bating alone is like taking one sentence out of context, and you cannot possibly discuss it intelligently. If I say that our idea is not to take out all the lime, I do not think it means anything because it would have to be discussed in the light of what went on before and what followed.

As long as I am on my feet, I will make one or two comments concerning the previous discussions. One concerns the pancreatic enzymes. I thoroughly agree with everything that was said by the previous speaker. Towards the end of the War, almost all of us were forced into using enzymes of other origins due to shortage of pancreas and our experience was not very satisfactory.

The difficulty concerns mostly the grain, even to the extent that in our particular case (and it might not apply anywhere else) it even affected grain strength.

The other item that was touched upon very briefly here was the washing before the bate which we consider a very, very important operation. We feel that keeping it under proper control contributes a great deal not only to the uniformity of the bate but to the uniformity of your entire product.

In addition to this washing, we also wash the skins out of the lime. This washing is so sensitive that if we find a 0.2 variation in the pH of the spent bate liquor, we can check back and usually find that something happened—that somebody slipped by washing a few minutes too much or too little.

MARTIN: If you bring up the question of washing we can get into a few arguments. If we were all in agreement it would be very unusual, but as far as washing is concerned, from the time when our skins go from the beamsters the wash is only sufficient to raise the temperature. You may like washing and I may not like it. We could go on from there. Are there any other comments?

ROSS: We wash our skins before bating which brings up a very important problem I imagine the rest of you have. If so, I hope you have an answer—especially if you leave your skins out of the lime overnight—in water of course—until you bate the next morning. Overnight the skins will get hard and swell up in water and we get rub marks. Do you get rub marks from skins in this condition?

MARTIN: We did not bate everything in one day. There was always something left over for the next day and we did not have complete uniformity so we switched and right now we will bate everything that day. In fact, before the men go home we have a second shift on the pickle so that those skins will go through the pickle too. There is nothing held over because we did not like the ununiformity of our leather from the two different days.

ROSS: I can see where that would help the rub mark problem.
Phil, do you get rub marks?

WAITE: No, we have not seen any as yet, or maybe we do not recognize them.

MARTIN: Chet, what do you mean by rub marks?

ROSS: A very slight grain scuff—generally a diagonal line right down the center of the skin caused by the bottom of the paddle.

IVANY: The fact that you keep one pack overnight, or all of them overnight and the rest you do not, has nothing to do with it as far as we are concerned.

We do not keep any of them overnight. We bate them the same day they come out of the lime and yet we get rub marks.

One thing I've found to be of some help. You have to be sure that the level of your water in the pit is up as high as it possibly can be. If the skins are floating too much on top, they get an awful whack from the paddle. If they float more in the liquor, this is minimized. I say minimized, but we still have it.

Last year I visited several European tanneries and I found that quite a few of them covered the edges of their paddle blades with soft rubber. We have tried it on two paddles but I cannot report success as yet.

ROSS: We do not think the mark that John and I are talking about comes from the paddle wheels. We think it comes from the bottom of the paddle. We feel sure the rub marks come from the skins being pushed against the bottom of the paddle by the motion of the paddle wheel when thy are in a swelled condition.

WAITE: I do not know what the design of your paddles is. I know it makes a terrific difference where you set those paddles. Ours are a little off center. We have had trouble with paddles in that respect and we finally found one to work right and we make them all like that now.

MARTIN: We had one further trouble. In checking through we found all the paddles did not dip down to the same depth. Some might dip down two inches further and those skins got harsher treatment. We expected them to be alike but we found some that went in, about ten years ago, dipped down a bit further. Some of those things that may be very simple can give you a lot of trouble.

BERNARD: Some paddles are made with a flange on the side of them and that flange sometimes rubs the skin. On the other hand a lot of paddles are made with spiders, and with the spiders there is no chance for the skin to wedge.

Further than that, I notice that the number of blades in some places will go up as high as eight or ten blades in a paddle wheel, whereas in other places they will have four, five or six. The more blades you have, the less whack you get when the paddle comes around. I notice that some paddles with eight or ten blades run very smooth, whereas, paddles with four or five or six blades have a decided whack every time they hit the water. I notice there are a lot of skins where, if the water gets too high, they sometimes will wrap around the axle, too.

LAUDER: I would like to know the temperature of the water in which these hides are left overnight. I would say that the colder the water, the more swollen and harder the skins become.

I have a second question. How soon do these rub marks show on the skins after the paddle is started?

Ross: The temperature overnight is about 75 and the marks cannot be seen until the leather comes through in the dry state—it is that slight an abrasion.

Chairman Morris: This discussion has progressed very well indeed, and has covered the beamhouse far beyond our expectations. And yet there are still many questions that can be answered. Unfortunately, we have a deadline of four o'clock, which leaves us three minutes.

The Committee wants to summarize and throw a question on the floor. We feel that there are many of these questions and problems that have arisen today in the discussion which correlate very well with research work. We are going to have but a couple of minutes to devote to that question. Possibly it could be taken care of by the various members through the Production Clubs, to write the ALCA, or right now, does anybody have any suggestions on that matter?

Lotz: I think if we are going to bother to come and talk about our processes and various parts of our tannery, one of the things that we must recognize immediately is that we have problems. And most of these problems are common problems to all tanneries. Probably there are a dozen tanners here today who wanted to talk about fine hair because it is a common problem. I notice also the question of eliminating the belly draws on short-time liming is another problem. We should use our Production Clubs for drawing up a list of research projects. Research men live on their own ideas, but if we are going to correlate leather research with our tanneries and production, we hope occasionally that the research men will work on a few of *our problems*.

So I would suggest that through our Production Clubs we get together a list of some of the common problems brought up by these discussions and submit them to ALCA and to the people who do research within the ALCA for future work and for presentation at the ALCA meetings.

D. Meo (Chairman of the Convention Committee:) I am sure we all feel deeply indebted not only to the members of this panel, but to the enlightened management which allowed this sort of thing to be done so excellently and something which we know could not have been done only a few years ago.

I know I speak for all of those who are still here, for those who have been here and for the Association, and to these gentlemen who have been taking this terrific licking up here, we owe an especially large vote of thanks. I only hope that we may meet again under the same auspices, with perhaps some of the suggestions that they may incorporate for future meetings, as expressed by Bob Lotz and by the Chairman, and that we will go on to more successful meetings in the future.